FINAL

ACTION PLAN FOR THE CAMP EDWARDS IMPACT AREA GROUNDWATER QUALITY STUDY

MASSACHUSETTS MILITARY RESERVATION
CAPE COD, MASSACHUSETTS

Volume III - Appendix E

Prepared for

NATIONAL GUARD BUREAU
ARLINGTON, VIRGINIA

pursuant to

THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, REGION I
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Prepared by

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July 1997

APPENDIX-E

Project Health and Safety Plan

Draft Final
Health and Safety Plan

For

ACTION PLAN FOR THE CAMP EDWARDS IMPACT AREA GROUNDWATER QUALITY STUDY MASSACHUSETTS MILITARY RESERVATION CAPE COD, MASSACHUSETTS

Prepared for:
National Guard Bureau
Arlington, Virginia

REVIEW AND APPROVALS:

Prepared by:

Geologist	**Date**

Approved by:

Health and Safety Manager	**Date**
Corporate Health and Safety Manager	**Date**
Program Manager	**Date**

This Site-specific Health and Safety Plan has been developed in accordance with OSHA 29 CFR 1910.120 and 29 CFR 1926.65.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Government Industrial Hygienists
AST	Aboveground Storage Tank
AVGAS	Aviation Gasoline
bgs	Below Ground Surface
Bla	Bladder
Blo	Blood
Cart.	Cartridge
cc	cubic centimeter
CD	Civil Defense
CFR	Code of Federal Regulations
CNS	Central Nervous System
CPR	Cardio-Pulmonary Resuscitation
CRZ	Contamination Reduction Zone
CV	Cardiovascular
dBA	Decibels (A-weighted scale)
decon	Decontamination
DOSH	(State) Department of Occupational Safety and Health
DOT	Department of Transportation
EC	Emergency Coordinator
EM	Electromagnetic
Encap	Encapsulating
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
ESA	Emergency Services Account (PWC)
eV	Electronvolt
EZ	Exclusion Zone
f/cc	Fibers per cubic centimeter
FM	Field Manager
FP	Field Procedure
FT	Field Trailer
ft	foot/feet
GFCI	Ground Fault Circuit Interrupter
GPR	Ground Penetrating Radar
gw	Ground Water
HBV	Hepatitis B Virus
HIV	Human Immunodeficiency Virus (AIDS)
Hrt	Heart
H&S	Health and Safety
HSM	Health and Safety Manager
HSMP	Health and Safety Management Plan
HSP	Health and Safety Plan

LIST OF ACRONYMS AND ABBREVIATIONS

H:V	Horizontal to Vertical
IDLH	Immediately Dangerous to Life and Health
IDW	Investigative-Derived Waste
IP	Ionization Potential (eV)
IPA	Isopropyl Alcohol
Kid	Kidney
lbs	Pounds
LEL	Lower Explosive Limit
Liv	Liver
mg/m^3	Milligrams (contaminant) per cubic meter (air)
Mod.	Modified
MOGAS	Motor Gasoline
MSDS	Material Safety Data Sheet
NIOSH	National Institute for Occupational Safety and Health
OHSC	Onsite Health and Safety Coordinator
OSHA	Occupational Safety and Health Administration
OVA	Organic Vapor Analyzer (FID)
OV/AG	Organic Vapor/Acid Gas
OVM	Organic Vapor Monitor (PID)
PAH or PNA	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene (a.k.a. Perchloroethylene)
PE	Polyethylene
PEL	Permissible Exposure Level (OSHA)
PID	Photoionization Detector
PMO	Program Management Organization
PM10	Particulate Matter <10 microns
PPE	Personal Protective Equipment
PPM	Project Procedures Manual (ANGRC IRP)
ppm	parts per million
Pros.	Prostate
Purif. Resp.	(Air) Purifying Respirator
QA/QC	Quality Assurance/Quality Control
RA	Removal Action
Resp.	Respiratory System
ROC	Record of Change (HSP)
RPM	Remedial Project Manager (formerly EIC)
SAP	Sampling and Analyis Plan
SOP	Standard Operating Procedure

LIST OF ACRONYMS AND ABBREVIATIONS

STEL	Short Term Exposure Limit
SVOC	Semi-volatile Organic Compound
SZ/CZ	Support Zone/Clean Zone
TBD	To Be Determined
TCE	Trichloroethylene
TLV	Threshold Limit Value (ACGIH)
TPH	Total Petroleum Hydrocarbons
TVH	Total Volatile Hydrocarbons
TZ	Transition Zone
UEL	Upper Explosive Limit
UST	Underground Storage Tank
V	Vehicle
VC	Vinyl Chloride
VOC	Volatile Organic Compound

1.0 INTRODUCTION

1.1 GENERAL INFORMATION

Client: Army National Guard

Client Contact: Captain James Boggess

Site Name & Location: MMR Impact Zone
Falmouth, MA

Client Tel. #: (703) 607-7983

Field Manager: John Rice

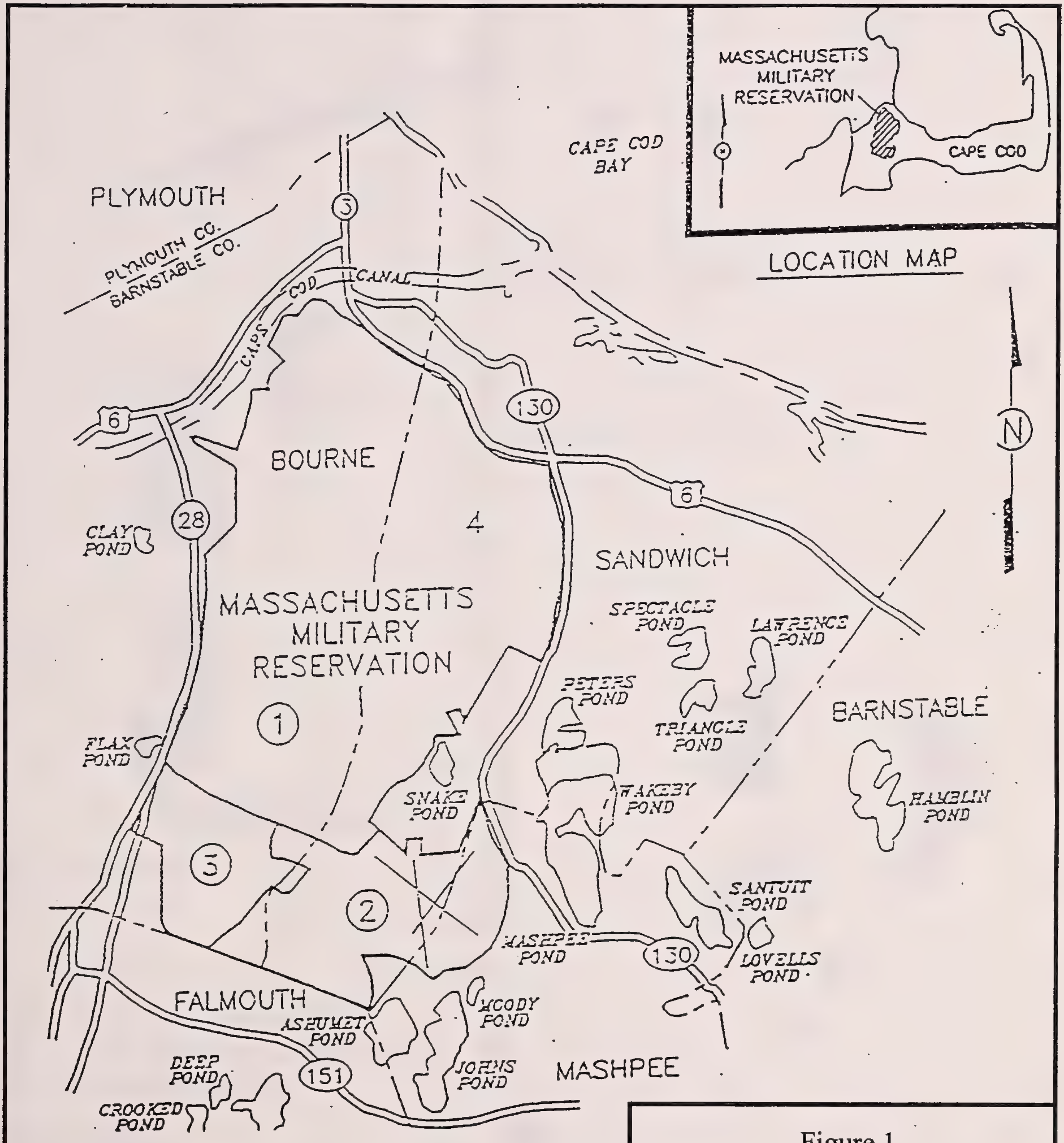
Project Manager: Marc Grant

Field Office Tel.#: TBD
Mobile Tel.#: (508) 970-7745

(See also Emergency Call List)

1.2 SITE DESCRIPTION AND FEATURES:

The Massachusetts Military Reservation (MMR) is a 21,000 acre facility located in western Cape Cod in the towns of Bourne, Falmouth, Mashpee, and Sandwich in Barnstable County (Figure 1). The facility is organized into four functional areas: (1) The Cantonment Area, which is the most actively used section, it consists of the base administrative, housing, maintenance and operation facilities (Area 2 on Figure 1); (2) The Training Range and Impact Area, which is used for military training, law enforcement training and sport shooting (Area 1 on Figure 1); (3) The Veterans National Cemetery which is located in the southwestern corner of MMR (Area 3 on Figure 1); and (4) Cape Cod Air Force Station which occupies the northeastern portion of the range area and houses the air defense warning system (Area 4 on Figure 1).



LEGEND

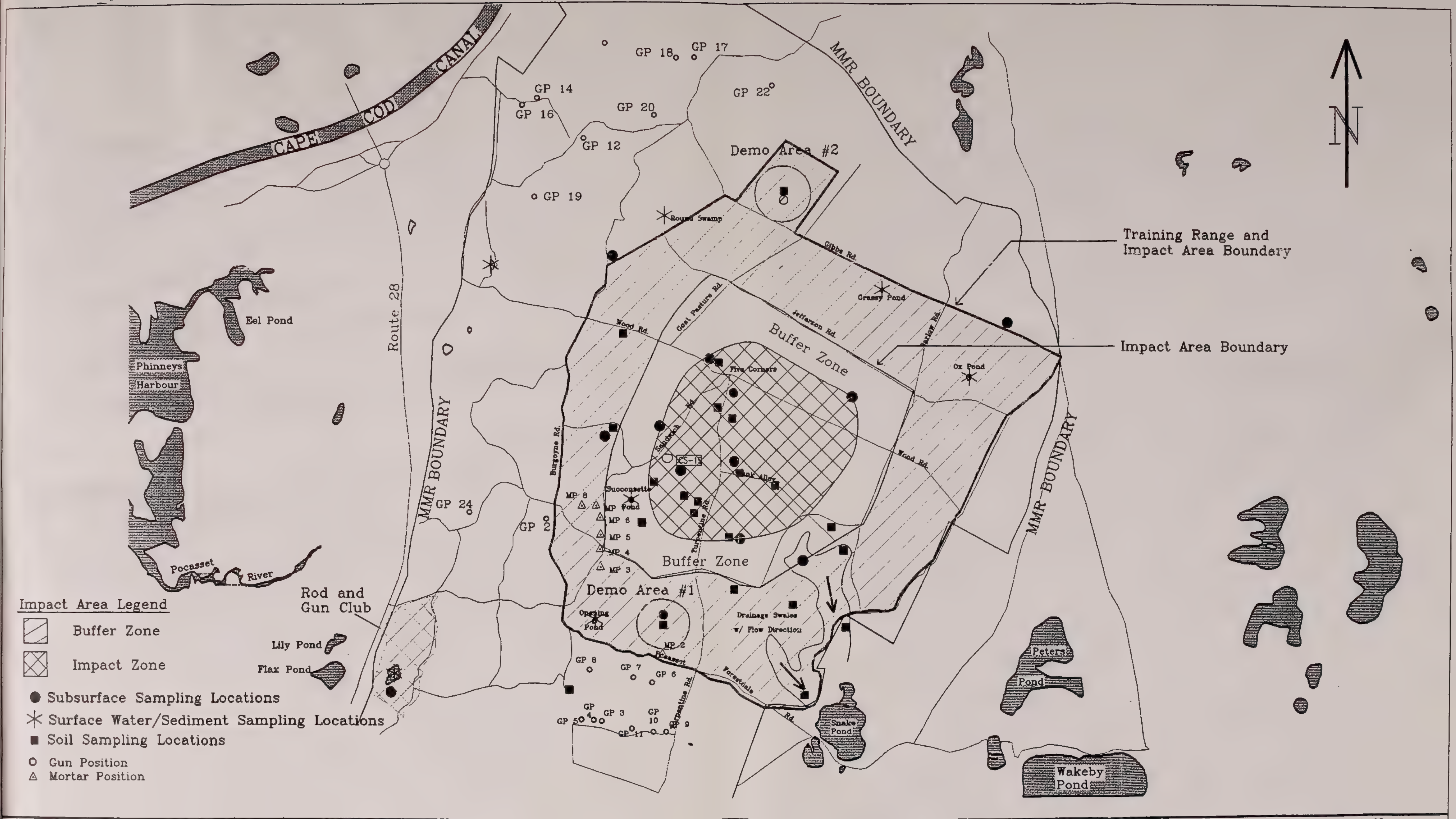
1 RANGE MANEUVER AND IMPACT AREA
2 CANTONMENT AREA
3 MASSACHUSETTS NATIONAL CEMETERY
4 CAPE COD AIR FORCE STATION (PAVE-PAWS)

Figure 1

Camp Edwards Impact Area Study

Site Location Map

Source: Aneptek, 1995



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0 1000 2500 5000
SCALE (FEET)

Source: Analysas, 1995 and US Defense Mapping Topo Maps

MMR IMPACT AREA WORKPLAN

FIGURE 2
SOIL, SURFACE WATER AND SEDIMENT
SAMPLING LOCATIONS

SCALE:
CONTRACT NO.: 97301.10
DATE: 5/97

1.3 BACKGROUND/SITE HISTORY:

For more than 40 years, the training range and impact area at MMR has been used for Military and law enforcement training. These training activities have been widely varied, as well as the size and types of munitions used. The impact of these activities and the fate of the spent munitions in the environment has been of interest for many parties on the Cape. The training and munitions used by activity and location are as follows:

a) Small Arms Firing Ranges: These are outdoor pistol and rifle training ranges typically consisting of a firing position, a cleared range area, a target position, and an impact berm. Typically, the weapons that have been fired in these ranges are small caliber weapons including 50 caliber or smaller munitions. The primary constituents of these munitions is led core in a metal alloy jacket, usually composed of copper, iron, antimony and nickel.

b) Artillery and Mortar Positions: These are small sites in the range area where the artillery and mortars are placed and fired at targets in the impact area. In the past, the spent shell casings and propellant bags were disposed of at these locations and/or in the vicinity of the artillery and mortar locations. The munitions used at these sites include 105mm, 155, and 8 inch caliber artillery projectiles and 60 mm, 81 mm, and 4.2 inch mortar cartridges. The chemical constituents of these munitions are similar to those used at small arms ranges but also include explosive compounds.

c) The Impact Area: This is the centrally located area in the range that contains the targets used for artillery and mortar firing. When the rounds fired are detonated, the explosive materials are generally consumed at the time of detonation. Sunlight degrades most of the remaining explosives. The metal shell casing breaks up into small pieces.

d) Demolition Areas: These two locations are ranges that are used to practice detonation procedures for explosives. The environmental impacts associated with these ranges may be similar to the target areas in the impact area.

Explosives are defined as materials which have the potential to chemically change from a solid to a large volume of hot gasses very quickly. High explosives (HE) are materials which undergo the chemical change at a rate faster than the speed of sound,

such as TNT (trinitrotoluene), RDX (Cyclonite), mercury fulminate, and lead azide. Low explosives undergo a chemical change at a rate slower than the speed of sound and include black powder, smokeless powder and other propellants. TNT has been the most widely used military explosive since World War I. RDX was developed during World War II, and is used in combination with TNT. Mercury fulminate and lead azide are used as primers in ammunition and are unstable.

1.4 SCOPE OF WORK/PLANNED SITE ACTIVITIES:

The goal of this project is to study the groundwater quality beneath the training range, and impact area at the MMR. It is anticipated that the field investigation will run for a duration of approximately five months. The activities which are to be conducted as part of this study are UXO clearance, brush clearing and road building, drilling, soil sampling, monitoring well installation, well development, well sampling, surface water / sediment sampling, equipment decontamination, and aquifer testing. Details of each activity are described below:

- Unexploded ordinance (UXO) clearance will be performed by a licensed subcontractor. Surface clearance will be performed on all access roads to monitoring well, surface soil, and surface water sampling areas. At each monitoring well location the subsurface UXO clearance will be performed to a depth determined by the ARNG as the maximum depth of penetration of ordinance at the MMR site. The subsurface clearance will be performed by surface clearing to a depth of two feet. A hollow stem auger drill rig will drill down to a depth of two feet. The drilling tools will be removed from the boring and the UXO will be cleared for the next two feet. The drill tools will be inserted back into the boring and advanced two feet, and removed from the boring for UXO clearance. This process will continue to the depth determined to be safe from UXO.

- In some locations brush clearing and minor road building will be required to get access to the soil boring and sampling locations. Brush clearing and road building will be completed by the drilling subcontractor using heavy equipment such as bulldozers, loaders, and dump trucks. For road building in the impact zone, fill material will be used to build up roads instead of scraping and leveling the existing grade.

- A total of 44 monitoring wells will be installed. The monitoring well locations outside the impact zone will be drilled using a sonic drilling rig. Due to the vibrations produced from a sonic rig and the potential of UXO, the monitoring wells inside the impact zone will be drilled using a dual rotary rig. There are three types of monitoring well configurations to be installed. There are single water table well installed to a depth of 100 to 150 feet below ground surface (bgs), there are double nested wells which consist of a water table well and a deep well set at the bedrock approximately 400 feet bgs, and there are triple nested wells which consist of water table wells, deep wells and intermediate wells installed at a depth determined by field screening.

- Soil sampling will occur when drilling the soil borings and when hand augering the surface soil. When drilling soil samples will be collected every ten feet for geotechnical logging, field screening, and chemical analysis. There are two methods used for collecting soil samples during drilling. Sonic drilling will use a 10-foot long, 4-inch diameter core barrel to collect continuos soil samples. Dual rotary drilling will used standard split spoon sampling to collect soil samples.

  Surface soil samples will be collected from a depth of 0 to 2 feet below the ground surface using a hand auger. Surface soil samples will field screened and laboratory analyzed.

- All 44 newly installed monitoring wells will be developed to remove fine grained sands and silts from the well. Monitoring well development will performed using an air lift system operated by the drilling subcontractor with Ogden oversight. All development water will be treated with a portable activated carbon treatment system and discharged to the ground surface.

- The 44 newly installed wells and the 24 existing wells will be sampled using a submersible pump with the low flow purge and sample technique. Purge water will be treated using a portable activated carbon treatment system and discharged to the ground surface.
- Surface water and sediment samples will be collected from several ponds on the subject site. The surface water samples will be collected various depth using a small

boat and an alpha horizontal sampling bottle. The sediment samples will also be collected from the boat using a clamshell dredge.

- All equipment will be decontaminated prior to use and between sample locations. All heavy equipment, tools, and drill rods will be decontaminated at a decontamination pad using a steam cleaner.

  Small equipment (e.g. split spoons, pumps, etc.) will be decontaminated at each sampling location prior to use. The decontamination process will used tap water, liquinox, methanol, and deionized water.

- To measure aquifer parameters, all wells will have slug tests performed on them. Intermediate and deep wells will have a pressureized system to displace the water table. Shallow wells will use a slug to displace the water table. The water displacement will be monitored using a data logger and pressure transducer.

- Investigation derived waste will be managed in multiple manners. Purge water, drilling water, and development water will be treated through a portable activated carbon unit and then discharged to the ground surface. Decontamination water will be stored temporally for later testing and treatment. Soils will be stockpiled and sampled at each drilling location. If the sample results show no contamination then the soils will be spread out on the ground surface. If there is contamination the soils will be drummed and stockpiled in a central location for later disposal.

1.5 SCHEDULED ONSITE PERSONNEL:*

NAME	COMPANY	PROJECT TITLE
Marc Grant	OEES	Project Manager
John Rice	OEES	Field Manager
Sam Farnsworth	OEES	Field Manager
Rob Pappalardo	OEES	Field Technician
Pete Desrocher	OEES	Site H&S Coordinator
TBD	CMS	UXO Surveyors
	TBD	Land Surveyors
	TBD	Drillers
	TBD	Equipment Operator(s)
	TBD	Land Surveyors

* Note that all personnel arriving or departing the site should log in and out on the Daily Employee/Visitor Roster (Appendix 2). Substitutions will be made with similarly qualified personnel; the ROC must reflect all personnel changes. All personnel requiring access to controlled work areas must have completed the training and medical administrative control requirements.

1.6 PERSONNEL RESPONSIBILITIES

Site Health and Safety Coordinator (SHSC)

Reports jointly to the Divisional Health and Safety Manager or the Project Health and Safety Manager and the Field Manager (FM) for all aspects of the project and is the primary contact for health and safety during all field activities. Establishes work zones, evacuation routes, and assembly areas. Makes the day-to-day decision to modify levels of protection provided in the HSP based on site conditions or monitoring data. Provides necessary support to the Emergency Coordinator (see Project or Field Manager below). Has the authority to stop all work if conditions are judged to be hazardous to onsite personnel or the public, and reports and investigates accidents and near-misses. Other specific responsibilities are detailed within Section 3 of Volume II of the Corporate Health and Safety Manual.

The SHSC or designee must carefully document the implementation of this HSP by maintaining the Project Health and Safety Files.

Health and Safety Manager (HSM) or Project Health and Safety Manager (PHSM)
Responsible for the review and approval of the HSP and coordinating the implementation of health and safety procedures through supervision/direction of the SHSC. Responsible for approval of all changes made to this HSP.

Project or Field Manager (PM or FM)
The project or field manager (PM or FM), also referred to as the Site Superintendent, has responsibility for all field activities, enforcement of safe work practices, and ensuring that daily tailgate meetings are conducted (either by the PM or FM, SHSC, or a rotation of field team members and subcontractor team members). Serves as the Emergency Coordinator (EC) in emergency situations. The PM or FM assumes (or assigns to a qualified person) the SHSC duties and responsibilities when the SHSC is not onsite.

Technical Staff
All Ogden and subcontracting personnel are responsible for compliance with this HSP in its entirety. They are responsible for taking all reasonable precautions to prevent injury to themselves and to their fellow employees and for being alert to potentially harmful situations. Technical staff members are expected to perform only those tasks that they believe can be done safely and to immediately report any accidents, near misses, and/or unsafe conditions to the SHSC or the FM.

Subcontractors
Responsible for the conduct of their personnel while onsite and ensuring their compliance with this HSP, notifying the SHSC of any special medical conditions that could be affected by site conditions (e.g., allergies, diabetes, etc.), and correcting any unsafe acts/conditions that are identified by the PM or FM or SHSC.

2.0 PERSONNEL PROTECTION

The prescribed methods and procedures used to protect personnel (site workers and adjacent community) from overexposure to hazardous materials and hazardous conditions posed by site operations are grouped into three primary categories: Administrative Controls, Engineering Controls, and Personal Protective Equipment (PPE).

2.1 ADMINISTRATIVE CONTROLS

2.1.1 Medical Surveillance

Periodic Comprehensive Exam:

All personnel requiring access to controlled work areas will have completed a pre-assignment medical examination and a periodic (usually annual) update examination prior to assignment, in accordance with OSHA 29 CFR 1910.120(f). The exam must be performed by an Occupational Health Physician, who will provide a written clearance for hazardous waste site work and for respirator usage. Exam protocols must be at least as stringent as those defined in the OEES Medical Surveillance Program.

Emergency Medical Treatment:

Personnel who exhibit signs and symptoms of chemical or heat overexposure, or have been injured on the job, might also seek medical services. See also the Emergency Response (Section 9.3) for specific information regarding emergency services and logs, reports, and record keeping; Section 2.1.5, for required report submittals. Subcontractors should provide internal Workers' Compensation information to the SHSC, or HSM/PHSM during the pre-work meeting, for emergency use.

Special:

Field personnel should have current (within 10 years) Tetanus shots.

2.1.2 Training

Comprehensive:

All routine onsite general site workers performing intrusive activity or having potential to receive exposures exceeding permissible limits will have completed the OSHA 40-hour

Hazardous Waste Operations Training. 24-hour onsite supervised training and appropriate annual (within 12 months) updates. Supervisors will have completed the above and an additional 8 hours of OSHA Supervisory Training. All OEES staff will have completed training in First Aid/CPR and fire extinguisher usage. In accordance with 49 CFR 172, DOT HM126F training is required for all employees who handle, transport, or prepare to transport hazardous materials.

Occasional site workers that are not expected to receive exposures exceeding permissible exposure limits (e.g., geophysical and land surveyors) require only 24 hours of OSHA Hazardous Waste Operations Training and 1 day of onsite training and supervision.

Specialized:

Prior to the initiation of site activities, the SHSC and PM/FM will conduct a H&S "kick-off" meeting. At this time, pertinent OEES SOPs and the site-specific Health and Safety Plan (HSP) will be discussed in detail with special attention being given to site chemical and physical hazards, PPE, emergency procedures, etc. Upon completion of this briefing, all routine field personnel, including subcontractors, will be required to read and sign the acceptance sheet of this HSP.

Site visitors and nonroutine subcontractors who do not attend this meeting will be required to undergo a specialized health and safety orientation, as documented on the Visitor and Subcontractor Orientation Form in Appendix 2.

Daily:

"Tailgate" safety meetings will be conducted each morning by the PM/FM, SHSC, or a rotation of OEES and subcontractor team members for all phases of work. Topics of discussion will include work tasks and designated PPE, emergency procedures, evacuation routes, instruction in use of safety equipment (as required), prior safety problems, recognition of signs and symptoms of overexposure, importance of proper decontamination, and personal hygiene, etc. These meetings must be documented; forms are provided in Appendix 2.

2.1.3 Accident Prevention

The accident prevention measures are as follows:

- The buddy system will be used at all times. All crews will consist of a minimum of two people. All crews and Range Control will be supplied with two-way radios. Any person who will be onsite without a "buddy" will be required to have a two-way radio or telephone with them.
- Safety vests will be worn by all ground crew members when equipment is being used (i.e. dump trucks, backhoes, and bulldozers).
- Exclusion Zones limits will be clearly marked. Only essential personnel will be allowed inside the exclusion zone and only with the proper equipment.
- Good house keeping practices will be used at all times.
- Air monitoring will be performed and recorded on an hourly basis. Air monitoring will consist of FID, Dust monitoring, and noise monitoring.
- Hearing protection required signs will be posted in locations where the noise level is above 85 Db on an 8 hour time weight hour average.
- Proper lifting techniques will be used by all personnel.

2.1.4 Safe Work Practices :

1) Unauthorized personnel are not allowed onsite, particularly in the Exclusion Zone (EZ).
2) Work groups will always consist of at least two (2) team members.
3) A high standard of personal hygiene will be observed. Smoking, eating, drinking, chewing gum or tobacco, taking medication, and applying cosmetics will not be permitted within any restricted or exclusion zone.
4) Wearing of contact lenses in uncontaminated atmospheres is prohibited.

5) Open flames are not allowed anywhere onsite without a hot-work permit.

6) Personnel under the obvious influence of alcohol or controlled substances are not allowed onsite; those taking medications must notify the SHSC.

7) Personnel will avoid skin contact with contaminated or potentially contaminated media. If such contact occurs, the affected areas should be washed thoroughly with soap and water.

8) Personnel will discard and replace any damaged or heavily soiled protective clothing. Discarded PPE will be drummed at the end of each day.

9) Personnel should notify the SHSC of any defective monitoring, emergency, or other protective/safety equipment.

10) A supply of potable water, electrolyte replacement solutions, shaded break area, and sufficient lighting will be maintained onsite; sanitary facilities will be accessible to personnel.

11) Owners/operators of heavy equipment will ensure that they are in good working order by performing daily inspections and routine maintenance. Deficiencies affecting health and safety shall be corrected prior to equipment use.

12) All unsafe conditions shall be made safe immediately. All unsafe conditions not in the scope of the project shall be reported to the PM and the condition corrected.

13) All site personnel will familiarize themselves with these and the emergency procedures during daily tailgate and prework safety meetings.

14) Following safe work practices reduces the likelihood of an accident, illness, or injury during field activities.

15) Loose-fitting clothing or loose long hair are prohibited near moving machinery.

16) Workers who are passengers or drivers of vehicles (both offsite and onsite) will wear their seat belts any time the vehicle is in motion.

17) All internal combustion engines must have spark arrestors that meet the requirements for hazardous atmospheres if they are to be used in such areas.

18) Do not fuel engines while vehicle is running.

19) Install adequate onsite roads, signs, lights, and devices.

20) Where portable electric tools and appliances can be used (where there is no potential for flammable or explosive conditions), they will be equipped only with 3-wire grounded power and extension cords to prevent electrical shock.

21) Store tools in clean, secure areas so they will not be damaged, lost, or stolen.

22) Access to location in the impact zone or buffer zone will only be allowed in areas that have been cleared of UXO.

23) All personnel entering the training area, impact zone, or buffer zone must attend the ARNG UXO briefing prior to access to these areas.

2.1.5 Logs, Reports, and Record Keeping

Submittal of Certifications:

Proof of health and safety training and medical certifications must be submitted to the PM or FM and SHSC by the subcontractor prior to the mobilization of field crews. The SHSC will maintain onsite a copy of the certifications (and all ROCs for revisions of personnel additions and substitutions) certifying that all OEES and subcontracted personnel have satisfied the minimum training and medical requirements listed above. Supporting documentation and certificates will remain on file with the HSM or PHSM and the Purchasing Department (subcontractors only). Field projects will not be allowed to take place in the absence of adequate documentation.

Site Monitoring, Reports, and Records:

The health and safety field files maintained by the SHSC, or his/her designee, will be the primary form of record keeping and documentation of site health and safety activities. These documents will be completed in sufficient detail to document the work performed; any unusual or significant circumstances under which the work was performed; any unanticipated/unplanned action taken to mitigate or to otherwise cope with unexpected field conditions; and pertinent comments about site-specific conditions that could have a bearing on the work performed. Documentation is required for all phases of work. See also the SHSC duties listed under Personnel Responsibilities. Record keeping practices will follow 29 CFR 1910.20.

The Health and Safety Binder will contain the following documents; all blank forms (designated by an asterisk) are provided in Appendix 2 to this HSP:

- certification of medical and training requirements
- signed acceptance sheet of this HSP (signed by all routine onsite personnel)
- safety inspection records including violations and remedial action plans
- health and safety notations made in the Site Log Book that is held by the PM or FM
- OSHA Form No. 200

- Employee/Visitor Daily Roster
- Visitor and Subcontractor Health and Safety Orientation forms
- Daily Tailgate Safety Meeting reports
- Instrument Calibration Log
- Machinery and Mechanized Equipment Certification form
- Daily Drill Rig Checklist
- Air Surveillance records
- Workplace Monitoring Exposure records
- Supervisor's Report of Injury or Illness and First-aid Incident reports
- Accident/First-Aid Incident Summary Log
- HBV Vaccination Declination form
- Incident Report (for environmental incidents, equipment damage, and work stoppages)
- completed Record of Change forms (ROCs) to this HSP
- SHSC Biweekly Summary (submit for field projects lasting longer than 2 weeks)

2.2 ENGINEERING CONTROLS

2.2.1 Barriers

Barricades:

Barricades, traffic cones, and/or marking/caution tape will be erected at a safe distance from excavations, pits, hazardous areas, and moving equipment to prevent unauthorized access to work areas from vehicular and pedestrian traffic. Barriers will be appropriate for the level of work activities and anticipated traffic. Signs will be conspicuously posted as

("CONSTRUCTION AREA - Authorized Personnel Only"), or equivalent.

2.2.4 Dust Suppression

When necessary, dust suppression techniques will be employed to minimize the generation of dust/particulates and associated contaminates into the atmospheres, to the

greatest extent possible. The *(water tap should be fitted with a nozzle or other device)* to create a water spray or curtain to contain dusts. Also, stationary sources of dusts, e.g., stockpiles, should be covered with a plastic (visqueen) or canvas tarping. Trenching operations have the largest dust-generating potential; therefore, modification (reduction) of work pace may be necessary to reduce visible emissions *(dust screens shall be moved as needed)*. Monitoring of the work areas and the (*fencelines*) shall be conducted on a regular, frequent basis with the portable PM_{10} dust monitor to ensure engineering controls are effectively reducing concentrations below action levels.

2.2.3 Rinsate Collection/Containment

A system for collection of rinsate from decontamination operations (heavy equipment, sampling equipment, and personnel decon) will be required. The system will be as complex or simple as necessary to collect and contain spent decon fluids, including overspray from steam-cleaning operations. Construction of the "permanent" heavy equipment decon area and all areas where steam cleaning of sampling equipment (augers, spoons, etc.) will be the responsibility of the equipment contractor. Construction of the temporary stations for personnel and other sampling equipment will be the responsibility of the SHSC and FM. Decon buckets should be placed in larger, plastic bins to contain splash. All spent fluids will be containerized in accordance with procedures/guidelines referenced in this HSP (see Decontamination Procedures, Section 8.0).

2.2.4 Noise Reduction

Site activities in proximity to welding, construction, and heavy equipment often expose workers to excessive noise. It is anticipated that situations may arise when noise levels may exceed the OSHA Action Level of 85 dBA in an 8-hour time-weighted average (TWA). An example of this possibility is working in close proximity to the subcontractor during drilling or trenching activities onsite. Ear plugs will be issued to all personnel working around heavy equipment and a system of hand signals will be implemented (see Section 5.4).

2.3 PERSONAL PROTECTIVE EQUIPMENT (PPE)

2.3.1 Levels of Protection

Initial levels of protection for this site may vary depending on the task. All personnel entering controlled work zones will initially be required to wear the Level of Protection as specified in the Task Hazard Analyses section and summarized in Table 1 below.

Table 1

INITIAL* ASSIGNMENTS OF PROTECTION LEVELS, TRAINING, AND MEDICAL SURVEILLANCE ASSIGNMENTS FOR SITE WORK TASKS

Task Name	Level of Protection	HAZWOPER		
		40-hour Classroom Training	24-hour Classroom Training	Medical Surveillance
Surface UXO clearance	D			
Drilling	Mod. D**	yes		yes
Surface Soil Sampling	Mod. D**	yes		yes
Groundwater Sampling	Mod. D**	yes		yes
Aquifer Testing	Mod. D**	yes		yes
Surface water / Sediment Samp.	Mod. D**	yes		yes
Equipment Decontamination	Mod. D**	yes		yes
IDW Management	Mod. D**	yes		yes

* Initial assignments may be modified by the SHSC as additional data are received from monitoring data and compared to action levels (Table 5), or as warranted by site conditions. Any changes will be noted in this HSP and/or documented on ROCs (Appendix 2).

** Modified Level D PPE indicates the use of protective clothing but no respiratory protection.

Protection may be upgraded or downgraded depending on monitoring data (compared with action levels) and site conditions, as determined by the SHSC. All changes must be noted in this HSP and documented on ROCs (Appendix 2). The following outlines the minimum requirements for each level of protection that is assigned or potentially assigned.

Level D PPE:

- Work shirt and full-length cotton pants or coveralls
- ANSI standard steel-toed work boots
- ANSI standard hard hat (when working around heavy equipment or overhead "bump" hazards)
- ANSI standard safety glasses
- USEPA-approved hearing protectors (when working in high noise areas, e.g., steam cleaners and heavy equipment)

Modified Level D PPE:

- Level D equipment
- Tyvek® suits (upgrade to PE or Saranex-coated Tyvek® as needed)
- Outer chemical-resistant gloves and inner nitrile gloves
- Boot covers or chemical-resistant boots

Level C PPE:

- Level Mod. D equipment, with taping of suits to boots and gloves as necessary
- NIOSH-approved, half-face or full-face air-purifying respirator with organic vapor/acid gas cartridges and particulate prefilters (respirator usage clearance is defined in the Respiratory Protection SOP)

Level B PPE:

- Level Mod. D equipment, use of chemical-resistant suits, taped to boots and gloves
- NIOSH-approved, pressure-demand, full-facepiece SCBA or pressure-demand supplied-air respirator with escape-SCBA (additional employee training is required for Level B operations)

Level A PPE:

- Level B equipment, use of fully encapsulating suit

2.3.2 PPE Donning/Doffing Procedure

The following procedures are given as a guide; failure to adhere to these procedures may result in the PPE being ineffective against contaminants. These may be altered by the

SHSC if improvements can be made to the procedures and these changes are warranted in the field. Also, some articles of PPE may not be necessary for all site tasks.

PPE Donning Procedure (for Mod. Level D and greater):

- Inspect all protective gear before donning.
- Don Tyvek® suit, inner gloves and outer gloves, secure w/tape, as required, leave pull tab. If Tyvek® is loose secure w/tape to avoid capture in moving or rotating equipment.
- Don respirator. If not in Level C, maintain respirator in a sealed plastic bag onsite in case of an upgrade.

PPE Doffing Procedure (see also Decon SOP):

- Wash/rinse (if necessary) excess mud or other debris from outer boots, gloves, and clothing.
- Remove tape using pull tab and remove outer clothing in the order of boots, outer gloves, and Tyvek® suits. Place disposable and reusable PPE in designated (separate) containers.
- Remove respirator (if applicable). Decon and fit-check prior to reuse.
- Remove inner gloves.
- Enter the clean zone, wash face, neck and hands.

2.3.3 PPE Failure/Chemical Exposure

In the event of PPE failure, worker and buddy will cease work, perform personal decon procedures, and exit to the CZ/SZ. Refer to the MSDS and emergency actions section if emergency medical response is needed. If chemicals contact the eyes, irrigate for 15 minutes and consult a physician.

3.0 HAZARD EVALUATION

Chemical, physical, energy, biological, and operational safety hazards anticipated during this project will be evaluated in the tables and sections that follow Section 3.1. The tables provide the details that support the task-specific hazard analyses. Table 2 provides a general overview of the contaminants of concern; Table 3 provides chemical properties and exposure assessment data; and Table 4 summarizes the physical and operational safety hazards and control measures identified for this project. A complete hazard analysis of each site work task and the list of protective measures completes this section of Hazard Evaluation. Further details of specific control measures for these hazards are presented under the section heading: "Personnel Protection."

3.1 CHEMICAL EXPOSURE

The primary entry routes of potential contaminants and hazardous materials onsite include inhalation of vapors and dusts; skin contact with contaminated materials; and ingestion of airborne dusts or materials from hand-to-mouth contact due to inadequate personal hygiene. To minimize these exposure pathways, dust suppression techniques will be employed by the onsite subcontractor and the SHSC will periodically monitor for airborne contaminants in the work and perimeter areas. In addition, all required PPE as specified in the Hazard Analysis of Site Work Tasks section will be worn, and personal hygiene will be carefully monitored.

The following categories of contaminants of concern under investigation may be present at the site:
(List products/chemicals of concern and degradation products)

o Explosives	o	o
o Metals	o	o
o Pesticides	o	o
o Herbicides	o	o
o	o	o
o	o	o

In addition to the contaminants of concern, the following hazardous substances are anticipated to be brought onsite to supplement investigation activities:

- Methanol
- liquinox detergent
- Gasoline
- Diesel
- Calibration gases
- Calibration fluids
- Hydrogen

These hazardous materials are subject to the Hazard Communication Standard; required MSDSs are presented in Appendix 1. The hazardous materials must also be properly labeled with the identity of the hazardous chemical(s) contained therein and the appropriate hazardous warning information. The list above must be updated and MSDSs obtained and filed for any other hazardous substances brought onsite. For additional reference, see the Hazard Communication Written Program SOP, Volume VI, Corporate Health and Safety Manual.

3.2 PHYSICAL HAZARD DESCRIPTION AND CONTROL MEASURES

Potential physical hazards onsite include the following:

- Physical hazards associated with drill rigs or other heavy equipment.
- Back injuries do to improper lifting.
- Slips, trips and falls.
- Noise.
- Biological agents.
- Fire and explosion.
- Electrocution.
- Explosive ordnance.
- Heat stress.
- Inclement weather.

Control measures for physical hazards:

Drill Rigs and Other Heavy Equipment

Hazards arising from heavy equipment include:

- noise.
- physical injury from moving or breaking parts or machinery.
- physical injury from improper operation of equipment.
- ground collapse.
- nuisance dust emissions.
- electrical hazards.

Heavy Equipment Inspection

> Daily inspection of equipment and completion of a daily equipment check lists is required.
> All equipment operators must hold a State of Massachusetts Hoisting License in accordance with the Provisions S-53 of Chapter 146 of the General Laws.
> A copy of every equipment operators license shall be provided to OEES prior to any equipment operation.

Back Injuries

Workers will use proper lifting techniques, lifting with the legs and not the back. Loads greater than 50 lbs. require a second person or mechanical device.

Whenever possible, mechanical devices such as drum dollies, hand trucks and tool hoists(for lifting augers), should be used to lift or move heavy loads.

Slips, Trips, and Falls

Good house keeping will be used to avoid slips, trips, and falls around the sampling areas. Equipment will be kept in an orderly fashion and not left where it will impede access.

If a sampling area is covered with brush and trees, the area will be cleared prior to the beginning of work in that area. If access requires the building of a road, then the access road and work area will be constructed so that access for the equipment and personnel is adequate.

Noise

Site activities in proximity to generators, compressors, steam cleaners, other machinery, construction activities, and heavy equipment often expose workers to excessive noise. The effects of this noise can be

- psychological effects: workers being startled, annoyed, or distracted
- physiological effects: pain, temporary and/or permanent hearing loss, reduced muscular control (when exposure is severe)
- communication interference: increase in potential hazard due to the inability to warn of danger or properly issue instructions.

It is anticipated that situations may arise when site personnel may be exposed to noise levels in excess of the 85 decibel A-scale (dBA), OSHA 8-hour time-weighted average (TWA) action level. Excessive noise environments may be created by heavy equipment during drilling operations or by other machinery operating in proximity to project operations. Any activity where there is an expected noise hazard, all personnel will be issued hearing protection. During the first week of drilling activity the noise level will be monitored with a noise dosimeter.

Biological Agents

Due to certain site locations and terrain, there is a possibility of biological hazards arising from

- toxic or irritant plants
- hazardous insects (bees, wasps, ticks)

- venomous or aggressive reptiles
- feral or rabid animals
- soilborn or waterborne fungi, or viruses
- poisonous or dangerous aquatic life and hazardous aquatic environments
- exposure to bloodborne pathogens during CPR or first-aid administration to injured workers

OEES staff will be trained to identify and avoid biological hazards. Site first-aid stations will be equipped to handle minor injuries. Any worker with a major injury will be transported to a medical facility. Tick repellent will be supplied to all personnel working outside.

Fire and Explosion

Fires can emanate from a variety of sources and can spread rapidly.
Safe practices shall be observed at all times.

1. Good housekeeping
2. Spark arresters on all internal combustion equipment shall be in place
3. Open flames are not allowed anywhere in work area
4. Do not fuel equipment while running
5. Observe grounding and bonding practices when fueling
6. Extinguishers will be accessible in all vehicles on site
7. Flammable liquids shall be stored in approved safety cans.

Explosion

Compressed gases must be stored and used in a safe manner.

Equipment e.g., generators shall not be fueled while in operation, or while hot enough to ignite fuel vapors.

Reporting Fire

A. Sound Alarm
B. Notify Fire Department
State type of fire, location, and any other associated hazards or injuries.
C. Make decision to use fire extinguisher.

D. Insure that all site occupants are safe
E. Proceed to safe meeting area.

OEES personnel will be trained in the proper use and operation of fire extinguishers.

Electrocution

Locate all overhead and underground utility power lines.

Confirm exact location of lines with hand tools, not heavy equipment; workers should be equipped with insulated protective gloves.

Lock-out and tagging of controls that are to be deactivated for maintenance/work on energized or de-energized equipment or circuits.

Ground-fault circuit-interrupters (GFIC) must be used on all 120 volt circuits.

The minimum distance between drilling masts and overhead power lines 50 kv is 15 ft, unless the lines have been de-energized and visibly grounded at the point of work, or equipped with insulated barriers to prevent physical contact.

Explosive Ordnance

Only essential personnel will be permitted to enter the impact zone. All personnel interring the impact zone for the first time will be required to complete the "Dud Identification Training" performed by the ARNG personnel in the Range Control Office.

All work areas in the impact zone will be cleared by the qualified Unexploded Ordnance (UXO) Clearing Subcontractor. The UXO clearing includes the surface clearing and the down hole clearing when drilling. The subcontractor will provide Ogden with their Health and Safety Plan for dealing with UXO clearance. This Health and Safety Plan will require the approval of Ogden prior to the commencement of work.

The UXO subcontractor will clearly mark out locations that have been cleared of UXO. Under no circumstances will any personnel be permitted to access any location that has not been cleared of UXO.

Heat Stress

Heat stress represents the imbalance between the heat the body is producing during its work and the heat it can get rid of. When the body loses excessive amounts of water and salts a person becomes tired, stressed, and worn down, causing loss of energy, irritability, lack of concentration ands increased anxiety.

Heat Rash
Symptoms: prickly heat, the skin swells, the sweat glands are inflamed
Treatment: remove from hot environment

Heat Cramps
Symptoms: painful muscle spasms due to loss of electrolytes (salt) with sweat
Treatment: replace lost water, rest

Heat Exhaustion
Symptoms: heavy sweating, extreme weakness or fatigue, dizziness, nausea headache, clammy skin, pale or flushed complexion, normal or slightly high body temperature, vomiting or loss of consciousness
Treatment: Rest in a cool place and take water. Mild cases may recover right away, severe cases may require care for several days. See a doctor. There are no permanent effects.

Heat Syncope (Fainting from Heat)
Symptoms: Fainting, after standing for a period of time in heat
Treatment: Leave work, provide medical examination immediately

Heat Stroke

Symptoms: Usually, hot, dry skin, but may perspire; mental confusion, severe headache, nausea, unconsciousness. Convulsions may occur.
Treatment: Without quick and adequate treatment, the result can be death or permanent brain, liver, and kidney damage. Get medical assistance quickly! The person should be moved to a cool place, doused with water, and given water to drink. Medical assistance should be called to assess how serious the situation is, and to provide more dramatic intervention, if needed.

Prevention of Heat Stress

- Monitor pulse rate, body temperature, and weight. If, at the beginning of a rest period, the pulse exceeds 110 beats per minute, the oral temperature exceeds 99.6°F, or weight loss exceeds 1.5 to 2% of body weight, shorten the next work cycle by one third, and keep the rest period the same.

- Don't push your body. Be aware of heat stress symptoms, take frequent breaks in cool rest areas, and drink plenty of water, both before starting work and during each break.
- Drinking salt water or taking salt pills is no longer recommended; replacing fluids will adequately restore electrolytes.
- Do heavy work during the coolest part of the day.
- Mechanize heavy lifting to reduce body-generated heat.
- Maintain good physical condition.
- Acclimatize to heat by slowly increasing workload over 2-3 weeks, so that the body can adapt.
- Use white suits to minimize absorption of the sun's heat.
- Use suit-cooling techniques such as water-cooled vests or Vortex tube cooling with compressed air.

Inclement Weather

Hurricane season runs from June through October.

> A hurricane watch issued by the National Weather Service indicates that a hurricane is probable in the defined vicinity within the next 48 hour period.
>
> A hurricane warning is issued when a hurricane is imminent within the next 24 hour period.

Actions will be taken to secure materials and equipment in anticipation of severe weather.

1. Fasten down materials
2. Lower all elevated equipment (booms, derricks)
3. Personnel to seek shelter (designated area)
4. Protect equipment from potential damage and damage to clients property.

Electrical storms

Site work will not be conducted when there is a threat of lightning storms

1. Lower booms and derricks when possible
2. Seek shelter in ungrounded vehicle (support van, pick-up truck)
3 Stay clear of high or elevated ground objects (trees, towers, etc.)
4. Return to support area if time permits
5. Wait out passing of storm or further direction from field safety personnel.

Table 2

SITE CHARACTERIZATION

ANTICIPATED PHYSICAL STATE OF CONTAMINANT(S):

(√) Liquid
(√) Solid
( ) Sludge
( ) Gas/Vapors
( ) Unknown
( ) Other ____________

Notes: ____________

MATRIX:

(√) Surface soils
(√) Soils at depth
(√) Surface water
(√) Ground water
( ) Free product
( ) Other ____________

Notes: ____________

POTENTIAL HAZARDOUS PROPERTIES:

( ) Corrosive
( ) Toxic
( ) Inert
( ) Asphyxiant
(√) Flammable/Combust.
(√) Volatile
(√) Carcinogenic
( ) Compressed gas
( ) Radioactive
( ) Reactive
( ) Unknown
(√) Other: Explosives

Notes: ____________

CONTAINER/STORAGE SYSTEM INFORMATION:

( ) Tanks ____________
( ) Drums ____________
( ) Pipes ____________
( ) Quantity ____________
( ) Landfills/Dumps
( ) Impoundments
( ) Size/capacity ____________
( ) Surface
( ) Subsurface
(√) Uncontainerized
( ) In-Service
( ) Other ____________

Notes: ____________

CONDITION OF CONTAINER/STORAGE SYSTEM(S):

( ) Sound/Undamaged
( ) Deteriorated/Unsound
( ) Other ____________
( ) Confirmed leaks
( ) Suspected leaks
(√) N/A
( ) Unknown

Notes: ____________

Table 2 (Continued)

SITE CHARACTERIZATION

ORIGIN OR INDUSTRIAL APPLICATION OF CHEMICALS OF CONCERN:

Industrial Process

( ) Manufacturing
( ) Maintenance/Repair
( ) Painting/Coating
( ) Power Generation
( ) N/A
( ) Prev. Use
( ) Storage
(√) Other Training

Notes: Potential chemicals on site are the result of military training.

Chemicals Used or Identified

( ) Acids
( ) Caustics
( ) Halogen
(√) Metals
(√) Pesticides
( ) PCBs
( ) Phenols
( ) Paints
( ) Solvents
(√) Other: Explosives

Notes:

Oils/Fuels

( ) Fuel Oil
( ) Waste Oil
( ) Hydraulic Oil
( ) AVGAS
( ) MOGAS
( ) Jet Fuel
( ) Gasoline
( ) Leaded
( ) Other

Notes:

Sludges

( ) Metal sludges
( ) Oily sludges
( ) Septic sludges
( ) Other:

Notes:

Solids

( ) Asbestos
( ) Sandblast grit
( ) Landfill refuse
( ) Other:

Notes:

GENERAL NOTES:

Table 3

CHEMICAL HAZARD PROPERTIES AND EXPOSURE INFORMATION

CHEMICAL NAME/ SYNONYM	ACGIH TLV/ OSHA PEL	STEL/ IDLH	IP (eV)	LEL/ UEL	ROUTE/ SYSTEMS**		PROPERTIES/ CHARACTERISTICS
					Route	Symptoms	
HMX	NE/NE	NE	NE	NE	NE	NE	NE
TNT	0.5 skin/1.5 skin	NE/500	10.59	NE	Inh Abs Ing Con	Irrit skin, muc memb, liver dammage, jaun, cyan, sneez, cough, soar throat, peri neur, musc pain, kidney dammage, cataract, sens derm, leucyt, anemia, card irreg	Colorless to pale-yellow, oderless, solid or crushed flakes.
DNT	0.15 skin/1.5 skin	NE/50	NE	NE	Inh Abs Ing Con	Anoxia, cyan, anemia, juan, repro effects, (card)	Orange-yellow crystalline solid with characteristic odor
Aluminum	10/15	NE	NE	NE	Inh Con	Irrit eyes, skin, resp sys	Silvery-white, malleable, ductile, odorless metal
Chromium (total)	0.5/0.5	NE/250	NE	NE	Inh Ing Con	Irrit eyes, sens derm	Appearance and odor vary depending upon the specific compound
Copper	1.0/1.0	NE/100	NA	NA/NA	Inh Ing Con	Irrit eyes, nose, pharynx, nasal perf, metallic taste, derm, in animals: lung, liver, kidney damage, anemia	Reddish, lustrous, malleable, odorless, solid
Iron (as dust and fumes)	5.0/5.0	NE/2500	NA	NA/NA	Inh	Benign pneumoconiosis with X-ray shadows indistinguishable from fibrotic pneumoconiosis (siderosis)	Reddish-brown solid
Lead	0.05ca/0.05	NE/100	NA	NA/NA	Inh Ing Con	Weak, lass, insom, facial pallor, pal eye, anor, low-wt, malnut, constip, abdom pain, colic, anemia, gingival lead line, tremor, para wrist, ankles encephalopathy, kidney disease, irrit eyes, hypotension	A heavy gray, ductile, soft gray solid
Magnesium	10/15	NE/750	NA	NA/NA	Inh Con	Irrit eyes, nose, metal fume fever, cough, chest pain, flu-like fever	Finely divided white particulate dispersed in air
Manganese	0.2/5.0C	NE/500	NA	NA/NA	Inh Ing	Parkinson's, asthenia, insom, mental conf, metal fume fever, dry throat, cough, chest tight, dysp, rales, flu-like fever, low-back pain, vomit, mal, ftg, kidney damage	Metal: A lustors, brittle, silvery solid
Mercury	0.01/0.1C	NE/10	NA	NA/NA	Inh Abs Ing Con	Irrit eyes, skin, cough,chest pain, dysp, bron pneuitis, tremor, insom, irrity, indecision, head, ftg, weak, stomatitis, salv GI dist, anor, low-wt, prot	Metal: Silver-white, heavy, oderless, liquid
Vanadium	0.05/0.5 C	NE/35	NA	NA/NA	Inh Ing Con	Irrit eyes, skin, throat, green toung, metallic taste, eczema, cough, fine rales, wheez, bron, dysp	Yellow-orange powder or dark gray, odorless, flakes dispersed in air
Nickel	0.1/0.015	NE/10	NA	NA/NA	Inh Ing Con	Sens derm, allergic asthma, pneuitis, (carc)	Metal: lustrous, silvery, odorless solid
Arsenic	0.01/0.5	NE/NE	NA	NA/NA	Inh Ing Con	In animals: irrit skin, possible derm, resp distress, diarr, kidney damage, musc tremor, sex, possible GI track, terato, repro effects, possible liver damage	Appearance and odor vary depending upon the specific organic arsenic compound

Barium	0.5/0.5	NE/50	NE	NA/NA	Inh Ing Con	Irrit eyes, nose, upper resp sys, skin burns, gastroenterritis, musc spasm, slow pulse, extrasystoles, hypokalemia	White, odorless solid
Beryllium	0/002/0.005	NE/4	NA	NA/NA	Inh Con	Berylliosis (chronic exposure): anor, low-wgt, weak, chest pain, cough, clubbing of fingers, cyan, pulm insufficiency, irrit eyes, derm, (carc)	Metal: A hard, brittle, gray-white solid
Cadmium	0.002/0.005	NE/9.0	NA	NA/NA	Inh Ing	Pulm edema, dysp, cough, chest tight, subs pain, head, chills, musc aches, nau, vomit, diarr, anos, emphy, prot, mild anemia, (carc)	Metal: silver-white, blue-tinged, lustrous, odorless solid
Calcium	2.0/5.0	NE/NE	NA	NA/NA	Inh Con	Irrit eyes, skin, resp sys, cough	White, colorless powder or colorless crystals
Potassium	NE/NE	NE/NE	NA	NA/NA	NE	NE	NE
Silver	0.01/0.01	NE/10	NA	NA/NA	Inh Ing Con	Blue-gray eyes, nasal septum, throat, skin, irrit, ulceration skin, GI dist	Metal: white, lustorus soild
Zinc	10/15	500	NA	NA/NA	Inh	Metal fume fever, chills, musc ache nau, fever, dry throat, cough, weak, lass, metallic taste, head, blurred vision, low back pain, vomit, ftg, mal, chest pain, dysp, rales, decr plum func	White, odorless solid
DDE	1.0/1.0skin	NE/500	NE	NE/NE	Inh Abs Ing Con	Irrit eyes, skin, pares tongue, lips, face, tremor, appre, dixx, conf, mal, head, ftg, convuls, paresis hands, vomit, (carc)	Colorless crystals or off-white powder with a slight, aromatic odor (pesticide)
DDD	1.0/1.0skin	NE/500	NE	NE/NE	Inh Abs Ing Con	Irrit eyes, skin, pares tongue, lips, face, tremor, appre, dixx, conf, mal, head, ftg, convuls, paresis hands, vomit, (carc)	Colorless crystals or off-white powder with a slight, aromatic odor (pesticide)
Endrin ketone	0.1skin/0.1skin	NE/2	NE	NA/NA	Inh Abs Ing Con	Epilep convuls, stupor, head, dizz, abdom discomfort, nau, vomit, insom, aggressiveness, conf, leth, weak, anor, in animals: liver dammage	Colorless to tan crystalline solid, with a mild chemical odor (insecticide)
Endosulfan sulfate	0.1skin/0.1skin	NE/NE	NE	NA/NA	Inh Abs Ing Con	Irrit skin, nau, conf, agitation, flushing, dry mouth, tremor, convuls, head, in animals: kidney, liver inj, decr testis wieght	Brown crystals with a slight, sulfur dioxide odor (insecticide)
Alpha chlordane	0.5skin/0.5skin	NE/100	NE	NA/NA	Inh Abs Ing Con	Blurred vision, conf, ataxia, delirium, cough abdon pain, nau, vomit, diarr, irrity, tremor, convuls, anuria, in animals: lung, liver, kidney damage (carc)	Amber-colored, viscous liquid with a pungent, chlorine-like odor. (insecticide)
Gamma chlordane	0.5skin/0.5skin	NE/100	NE	NA/NA	Inh Abs Ing Con	Blurred vision, conf, ataxia, delirium, cough abdon pain, nau, vomit, diarr, irrity, tremor, convuls, anuria, in animals: lung, liver, kidney damage (carc)	Amber-colored, viscous liquid with a pungent, chlorine-like odor. (insecticide)
Dinoseb	NE/NE	NE/NE	NE	NE/NE	NE	NE	NE
MCPP	NE/NE	NE/NE	NE	NE/NE	NE	NE	NE
Hexachloroabenzene	0.025skin/NE	NE/NE	NE	NE/NE	NE	NE	NE

diethylphthalate	5.0/5.0	NE/NE	NE	0.7%/NE	Inh Ing Con	Irrit eyes, skin, nose, throat, head, dizz, nau, lac, possible polyneur, vestibular dysfunc, pain, numb, weak, spasms in arms&legs, in animals: repro effects	Colorless to water-white, oily liquid, with a very slight aromatic odor (pesticide)
N-Nitrosodiphenylamine	NE/NE	NE/NE	NE	NE/NE	NE	NE	NE

Source: The above information was derived from NIOSH Pocket Guide to Chemical Hazards, June, 1994. ACGIH Threshold Limit Values 1996.

Table 3 (Continued)

CHEMICAL HAZARD PROPERTIES AND EXPOSURE INFORMATION

*C	OSHA Ceiling Limit	PEL	- OSHA Permissible Exposure Limit	IP	- Ionization potential
IDLH	Immediately dangerous to life or death	NE	- None established	STEL	- Short-term exposure limit
LEL	Lower explosive limit	ppm	- Parts per million	UEL	- Upper explosive limit
mg/m^3	Milligrams per cubic meter	STEL	- Short term exposure limit	TLV	- ACGIH threshold limit values
NA	Not applicable	TWA	- Time weighted average		

**abd=abdominal
Abs=skin absorption
anes=anesthesia
anor=anorexia
arrhy=arrhythmias
Asb=asbestosis
asphy=asphyxia
BP=bloodpressure
bron=bronchitis
carc=carcinogen
card=cardiac
CNS=central nervous system
Con=contact
conf=confusion
constip=constipation
convuls=convulsions
cyan=cyanosis
decrs=decrease
depres=depressant
derm=dermatitis
diarr=diarrhea
dist=disturbance
dizz=dizziness
drow=drowsiness
dysp=dyspnea
emphy=emphysema
equi=equilibrium
eryt=erythema
euph=euphoria
extrm=extremities
fail=failure
fasc=fasiculation
FEV=forced expiratory volume
fib=fibrosis
ftg=fatigue
func=function
GI=gastrointestinal
gidd=giddiness
haul=hallucinations
head=headache
hemato=hemotopoietic
hemog=hemoglobinuria
hemorr=hemorrhage
hyper=hypersenstivity
hypox=hypoxemia
ict=icterus
inco=incoordination
incr=increase
inflam=inflammation
Ing=ingestion
Inh=inhalation
inj=injury
insom=insomnia
irreg=irregular
irrit=irritant
jaun=jaundice
kera=keratitis
lac=lacrimation
lar=laryngeal
lass=lassitude
leucyt=leukocytosis
leupen=lukopenia
li-head=lightheadedness
low-wgt=weightloss
mal=malaise
malnut=malnutrition
ment=mental
monocy-=monocytosis
muc memb=mucous membrane
musc=muscle
nau=nausea
nerv=nervous
palp=palpitations
para=paralysis
pares=paresthesia
perf=perforation
peri neur = peripheral neuropathy
periob=periorbital
phar=pharyngeal
photo=photophobia
pig=pigmentaiton
pneu=pneumonia
pneuitis=pneumonitis
PNS=peripheral nervous system
polneur=polyneuro-pathy
prot=proteninuria
pulm=polmonary
resp=respiratory
retster=retrosternal
salv=salivation
sens=sensitization
sez=seizure
som=somnolence
subs=substernal
sweat=sweating
swell=swelling
sys=system
tacar=tachycardia
tend=tenderness
tght=tight
uncon=unconsciousness
verti=vertigo
vesic=vesicuation
vomit=vomiting
weak=weakness
<wgt=weightloss

- ACGIH TLVs and OSHA PELs are "Time Weighted Average" (TWA) concentrations that must not be exceeded during any 8-hour shift or a 40-hour work week.
- Ceiling concentrations must not be exceeded during any part of the workday; if instantaneous monitoring is not feasible, the ceiling must be assessed as a 15-minute TWA exposure.
- IDLH represent the maximum concentration from which, in the event of respiratory failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing (e.g., severe irritation) or irreversible health effects.
- [Skin] designates the potential for dermal absorption; skin exposure should be prevented. The value only represents inhalation hazards.
- "Ppm" is parts per million by volume and is not equivalent to a ppm by weight in soil value, e.g., mg/kg.
- IPs (given in electron volt (ev) units) are presented for PID usefulness evaluation. The PID lamp should have an eV value greater than the analyte it is detecting.

† Exceeds PID detection capabilities.

Table 4

SUMMARY OF PHYSICAL AND OPERATIONAL SAFETY HAZARDS

OPERATIONAL SAFETY HAZARDS	CONTROL OR PROTECTIVE MEASURES
Physical hazards associated with drill rigs and other heavy equipment	o See also Excavation, Trenching, Shoring SOP, Drilling Safety SOP, Appendix 3; and Monitoring Well Installation SOPs. o Equipment will be inspected on a daily basis by the owner/operator, daily logs will be maintained. All discrepancies shall be corrected prior to placing the equipment in service. o Blades, buckets, and other heavy equipment will be kept fully lowered when not in use; parking brakes must be engaged. o Drill rods or core barrels shall not be left balancing, leaning, or otherwise unsecured on the rig. o Equipment parked on inclines shall have the wheels chocked or blocked and the parking brake set. o Equipment shall not be used on unstable or unsafe inclines. o Increase communication effectiveness with operators using hand signals, radios (as appropriate), and line-of-sight confirmation.
Entanglement in rotating or moving equipment	o Equipment shall not be operated without guards. o Loose-fitting or dangling clothes, hair jewelry are prohibited. o Stay clear of rotating augers and pinch points, such as cables and pulleys. o Passage under, or stopping over, a moving stem or auger is prohibited. o Drill crews are not allowed on the mast while the drill bit/auger is in operation or during transport. o Long-handled shovels will be used to remove cuttings from the auger. o Only the drill crew and the SHSC will be aware of the location and proper operation of the rig's emergency shut-down equipment (kill-switches, etc.), and procedures.

Table 4 (Continued)

SUMMARY OF PHYSICAL AND OPERATIONAL SAFETY HAZARDS

OPERATIONAL SAFETY HAZARDS	CONTROL OR PROTECTIVE MEASURES
Back injuries due to improper lifting of drums, augers, etc.	o Workers will use proper lifting techniques, lifting with the legs and not the back. Loads >50 lbs. require a second person or mechanical device. o Whenever possible, mechanical devices such as drum dollies, hand trucks and tool hoists (for lifting augers) should be used to lift or move heavy loads.
Slips, trips, and falls	o Clear work area of obstructions and debris prior to rig set-up. o Level and stabilize the rig prior to raising the mast. o Keep drill platforms, stairs, and immediate work areas clear; do not allow oil/grease and excessive mud to accumulate in these areas. o The discharge of drilling fluids and foam will be channeled away from the work area to prevent ponding or slippery conditions. o A safety harness and shock absorbing lifeline or adequate fall protection, shall be provided and its use required for each employee working >6 ft. above the platform or main work deck. o Open boreholes should be immediately backfilled, or be capped and flagged; open excavations will be barricaded or be covered with steel traffic plates. o Wherever possible, slip, trip and fall hazards will be eliminated or clearly identified with caution tape, barricades, or equivalent means.
Noise	o Hearing protection shall be worn during operation of heavy equipment, pneumatic power tools, steam cleaners and other equipment that potentially generates >85 dBA. o See also Hearing Conservation SOP, Vol. VI, Corp H&S Manual.
Biological agents	o Workers will not be exposed to infectious agents or wastes with the current scope of work; however, responders to first-aid incidents may contact bloodborne pathogens, and will follow the Bloodborne Pathogen Control Plan in this HSP. o Workers shall be protected from hazards of irritant and toxic plants and be suitably instructed in the first-aid treatment available.

Table 4 (Continued)

SUMMARY OF PHYSICAL AND OPERATIONAL SAFETY HAZARDS

OPERATIONAL SAFETY HAZARDS	CONTROL OR PROTECTIVE MEASURES
Biological agents (Continued)	o Personnel with known reactions to insect bites or stings should be identified during the "kickoff" meeting so that the appropriate emergency treatment can be made available onsite. o Workers should not attempt to capture any wild or semiwild animals due to the possibility of a bite or parasitic infection.
Fire and explosion	o See also Fire Prevention Safety Guidelines. o ABC fire extinguishers must be accessible in the work area. o Flammables must be stored in UL- and OSHA-approved metal safety cans with spark arrestors. o Flammable containers must be stored >50 ft. from the rig; portable (flammable) tanks must be >100 ft. from the rig. o The exhausts of equipment powered by internal combustion engines will be located well away from flammables and combustibles. o Hot work permits/approvals must be secured prior to welding or cutting (Appendix 2) o Compressed gases must be stored and used in a safe manner. o Equipment, e.g., generators, shall not be refueled while in operation, or while hot enough to ignite fuel vapors. o Operations that pose fire hazards should be conspicuously marked: "No Smoking" or "Open Flames." o Complete an Incident Report (Appendix 2) within 24 hrs. for all work shutdowns.
Electrocution	o See also the Utility Detection SOP. o Locate all overhead and underground power lines by geophysical methods (as feasible), reviewing engineering drawings, and by discussion with appropriate activity and/or utility personnel. Confirm exact location of lines with hand tools, not heavy equipment; worker(s) should wear rubber insulated protective gloves. o Lower the drilling mast prior to moving the rig any distance.

Table 4 (Continued)

SUMMARY OF PHYSICAL AND OPERATIONAL SAFETY HAZARDS

OPERATIONAL SAFETY HAZARDS	CONTROL OR PROTECTIVE MEASURES
Electrocution (Continued)	o Lock-out and tagging of controls that are to be deactivated for maintenance/work on energized or de-energized equipment or circuits. o Extension cords, power/electric tools, pumps, floodlights, and generators that are not doubly insulated must have functional grounding conductors. o Ground-fault circuit-interrupters (GFCIs) must be used on all 120-volt, 120-amp circuits. o The minimum distance required between drilling masts and overhead power lines <50 kv is 15 ft, unless the lines have been de-energized and visibly grounded at the point of work, or equipped with insulated barriers to prevent physical contact. o Site work will not be conducted when there is a threat of lightning storms.
Explosive ordnance	With an encounter of suspected or detected explosive ordnance (EOD or UXO): o Stop work. o Mark suspected/confirmed explosive ordnance with tape, traffic cone, or other easily visible marker. o Evacuate the area at least 100 ft. from the ordnance, as possible. o Call the Field Manager to assess whether the EOD/UXO unit should be called. o Conduct a Visitor Health & Safety Orientation and escort visitor to marked area. o Complete an Incident Report (Appendix 2) within 24-hrs. for all work shutdowns.
Trench collapse or cave-in	o Whenever possible, workers shall not enter trenches or test pits to collect samples, but use remote equipment or devices, e.g., backhoe buckets, hand augers, shovels, or equivalent.

Table 4 (Continued)

SUMMARY OF PHYSICAL AND OPERATIONAL SAFETY HAZARDS

OPERATIONAL SAFETY HAZARDS	CONTROL OR PROTECTIVE MEASURES
Trench collapse or cave-in (Continued)	o If entry is required at depths >4 ft., then the procedures in the Trenching and Excavation Safety Guidelines, will be followed, including use of OSHA sloping or shoring; a "competent" person to inspect the trench prior to entry; emergency retrieval systems, safe ladders, and use of a confined space entry permit as required to ensure safe atmospheres. o All simple slopes in excavations <20 ft. shall have a maximum allowable slope of 1.5:1 Horizontal:Vertical (H:V) or 34° as measured from the horizontal. o Excavated materials will be stored >2 ft. from the edge and/or have retaining devices. o All trenches/excavations shall be properly signed and barricaded to restrict unauthorized pedestrian and vehicular traffic. o Unattended open trenches are prohibited and should be back-filled upon completion or covered by steel traffic plates.
Heat stress	o See the Heat Stress Prevention SOP. o Workers will be trained to recognize signs and symptoms of heat illnesses. o Provide shelter or shaded area for work tasks (as feasible) and break areas. o Adjust work schedules by rotation of personnel or alternate job functions to minimize heat stress or overexertion at one task. o Perform work during cooler hours of the day (or night) as feasible. o Maintain normal body fluid levels by consuming 16 oz. (2 cups) of water prior to each shift and about 8 oz (1 cup) every 15-20 minutes. Two gallons of water should be consumed over an 8-hour period. o Wear nonbinding cotton clothing, e.g., medical scrubs and cotton undergarments under PPE to absorb moisture and to help prevent heat rash. o As feasible, provide field "showers" or hose-down areas to cool down body.

Table 4 (Continued)

SUMMARY OF PHYSICAL AND OPERATIONAL SAFETY HAZARDS

OPERATIONAL SAFETY HAZARDS	CONTROL OR PROTECTIVE MEASURES
Inclement weather	Work shutdown conditions: o Poor visibility. o Precipitation severe enough to impair safe movement or travel. o Lightning in the immediate area. o Steady winds >40 mph. o Other conditions as determined by the SHSC, FM or HSM. o Imminent threat of severe tropical storm or hurricane. o Complete an Incident Report (Appendix 2) within 24 hrs. for all work shutdowns.
Oxygen deficiency	o Prior to personnel entry for work, an attendant shall test confined spaces for oxygen deficient atmospheres, defined as <19.5 percent oxygen by volume in air (see also Table 5 of this HSP). These results will be verified by a supervisor onsite. o Whenever equipment powered with internal combustion engines (rigs, backhoes, generators, etc.) are used in enclosed spaces, atmospheres will be tested for LEL/O_2, as well as carbon monoxide and hydrocarbons. o See also Confined Space Entry SOP and the Trenching and Excavation Safety Guidelines.
Key	EOD = Explosive Ordnance Disposal FP = Field Procedure GFCI = Ground-Fault Circuit-Interrupter HSP = Health and Safety Plan SHSC = Site Health and Safety Coordinator SOP = Standard Operating Procedure UL = Underwriter Laboratories

3.3 HAZARD ANALYSIS OF EACH SITE WORK TASK

TASK NAME: DRILLING, SOIL SAMPLING, AND WELL INSTALLATION

Potential Hazards: (Check all that apply to either existing conditions or that result from site operations)

(√) Rotating Machinery
(√) Heat Stress
( ) Cold Stress
(√) Heavy Equipment
(√) Intrusive Activ's (underline)
  - Trenching
  - Drilling
  - Soil Vapor Surv.
  - Sampling
(√) Uneven terrain
( ) Trench/excavation collapse

( ) Projectiles
( ) Physical Exertion
(√) Noise (>85 dBA)
( ) Vehicle Traffic
(√) Fire/Explosion (underline)
  - Flam. Materials
  - Low-lying Areas
  - Fuel lines
( ) Work over water (lagoons, streambeds, ravines, bay ocean)

( ) Confined Space
( ) Biological (plants, rodent viruses, marine species, soilborne or waterborne fungi/bacteria, insects, arachnids, snakes, wild animals)
( ) Electrical (utilities)
(√) Chemical Exposure
(√) Other (List) - UXO

Control or Protective Measures: (see also Table 4)

(√) Tailgate Meetings
( ) Operator Training

(√) PPE, Level-mod D
(√) Site Control

(√) Air Monitoring
(√) Decontamination

( ) Engineering Controls: __________
( ) SOPs: __________
(√) Other: - UXO Clearance__________

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Initial levels of protection have been assigned for this work task based on the potential risk of exposure. Levels may be upgraded or downgraded depending on monitoring data (see Action Levels, Table 5) and site conditions, as determined by the Site Health and Safety Coordinator (SHSC). Any modification to the levels of PPE below must be noted here and documented with a completed ROC form (Appendix 2).

Level Of Protection: ( ) A ( ) C ( ) B (√) Modified D ( ) D

Respirator: (Level C and above) ( ) SCBA, Airline ( ) OV/AG Cart. ( ) Purif. Resp. ( ) Other __________ ( ) Escape Mask

Protective Clothing: ( ) Encap. Suit ( ) Saranex (√) Tyvek® ( ) Splash Suit ( ) PE Tyvek® ( ) Other __________

Head/Eye/Ear: (√) Hard Hat ( ) Splash Shield (√) Safety Glasses (√) Ear Plugs/Muffs ( ) Goggles ( ) Other __________

Gloves: (outer) (√) Nitrile ( ) Neoprene ( ) PVC
(inner) (√) Latex ( ) Vinyl ( ) Other __________

Footwear: (√) Steel-toed Leather ( ) Steel-toed Rubber ( ) Overboots ( ) Other __________

Modifications Permitted: __________

Ã = required PPE; * = modifications permitted; † =in case of upgrade.

TASK NAME: WELL DEVELOPMENT AND GROUND WATER SAMPLING

Potential Hazards: (Check all that apply to either existing conditions or that result from site operations)

( ) Rotating Machinery
(√) Heat Stress
( ) Cold Stress
( ) Heavy Equipment
( ) Intrusive Activ's (underline)
- Trenching
- Drilling
- Soil Vapor Surv.
- Sampling

( ) Uneven terrain
( ) Trench/excavation collapse

( ) Projectiles
(√) Physical Exertion
( ) Noise (>85 dBA)
( ) Vehicle Traffic
( ) Fire/Explosion (underline)
- Flam. Materials
- Low-lying Areas
- Fuel lines

( ) Work over water (lagoons, streambeds, ravines, bay ocean)

( ) Confined Space
( ) Biological (plants, rodent viruses, marine species, soilborne or waterborne fungi/bacteria, insects, arachnids, snakes, wild animals)
(√) Electrical (utilities)
(√) Chemical Exposure
(√) Other (List) - UXO

Control or Protective Measures: (see also Table 4)

(√) Tailgate Meetings
( ) Operator Training
(√) PPE, Level __
(√) Site Control
( ) Air Monitoring
(√) Decontamination
( ) Engineering Controls: ____________________
( ) SOPs: ____________________
( ) Other: - UXO Clearance____________________

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Initial levels of protection have been assigned for this work task based on the potential risk of exposure. Levels may be upgraded or downgraded depending on monitoring data (see Action Levels, Table 5) and site conditions, as determined by the onsite health and safety coordinator (SHSC). Any modification to the levels of PPE below must be noted here and documented with a completed ROC form (Appendix 2).

Level Of Protection: ( ) A	( ) C	(√) Modified D	
	( ) B	( ) D	
Respirator: (Level C and above)			
	( ) SCBA, Airline	( ) Purif. Resp.	( ) Escape Mask
	( ) OV/AG Cart.	( ) Other Cart. ______	
Protective Clothing:	( ) Encap. Suit	(√) Tyvek®	( ) PE Tyvek®
	( ) Saranex	( ) Splash Suit	( ) Other ______
Head/Eye/Ear:	( ) Hard Hat	(√) Safety Glasses	( ) Goggles
	( ) Splash Shield	( ) Ear Plugs/Muffs	( ) Other______
Gloves: (outer)	(√) Nitrile	( ) Neoprene	( ) PVC
(inner)	(√) Latex	( ) Vinyl	( ) Other ______
Footwear:	(√) Steel-toed Leather	( ) Overboots	
	( ) Steel-toed Rubber	( ) Other______	

Modifications Permitted: ____________________

Ã = required PPE; * = modifications permitted; † =in case of upgrade.

TASK NAME: SURFACE WATER AND SEDIMENT SAMPLING

Potential Hazards: (Check all that apply to either existing conditions or that result from site operations)

( ) Rotating Machinery
(√) Heat Stress
( ) Cold Stress
( ) Heavy Equipment
( ) Intrusive Activ's (underline)
- Trenching
- Drilling
- Soil Vapor Surv.
- Sampling

( ) Uneven terrain
( ) Trench/excavation collapse

( ) Projectiles
(√) Physical Exertion
( ) Noise (>85 dBA)
( ) Vehicle Traffic
( ) Fire/Explosion (underline)
- Flam. Materials
- Low-lying Areas
- Fuel lines

(√) Work over water (lagoons, streambeds, ravines, bay ocean)

( ) Confined Space
( ) Biological (plants, rodent viruses, marine species, soilborne or waterborne fungi/bacteria, insects, arachnids, snakes, wild animals)
( ) Electrical (utilities)
(√) Chemical Exposure
( ) Other (List)

Control or Protective Measures: (see also Table 4)

(√) Tailgate Meetings
( ) Operator Training

(√) PPE, Level __
(√) Site Control

( ) Air Monitoring
(√) Decontamination

( ) Engineering Controls: ____________________
( ) SOPs: ____________________
( ) Other: - Life jackets if in or over water____________________

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Initial levels of protection have been assigned for this work task based on the potential risk of exposure. Levels may be upgraded or downgraded depending on monitoring data (see Action Levels, Table 5) and site conditions, as determined by the Site Health and Safety Coordinator (SHSC). Any modification to the levels of PPE below must be noted here and documented with a completed ROC form (Appendix 2).

Level Of Protection: ( ) A	( ) C	(√) Modified D	
	( ) B	( ) D	
Respirator: (Level C and above)			
	( ) SCBA, Airline	( ) Purif. Resp.	( ) Escape Mask
	( ) OV/AG Cart.	( ) Other ____________	
Protective Clothing:	( ) Encap. Suit	(√) Tyvek®	( ) PE Tyvek®
	( ) Saranex	( ) Splash Suit	(√) Life Jacket
Head/Eye/Ear:	( ) Hard Hat	(√) Safety Glasses	( ) Goggles
	( ) Splash Shield	( ) Ear Plugs/Muffs	( ) Other ________
Gloves: (outer)	(√) Nitrile	( ) Neoprene	( ) PVC
(inner)	(√) Latex	( ) Vinyl	( ) Other ________
Footwear:	( ) Steel-toed Leather	(√) Overboots	
	( ) Steel-toed Rubber	( ) Other - Chest waders if in water_______	

Modifications Permitted: ____________________

Ã = required PPE; * = modifications permitted; † =in case of upgrade.

TASK NAME: UNEXPLODED ORDANCE CLEARANCE

Potential Hazards: (Check all that apply to either existing conditions or that result from site operations)

( ) Rotating Machinery
(√) Heat Stress
( ) Cold Stress
( ) Heavy Equipment
( ) Intrusive Activ's (underline)
  o Trenching
  o Drilling
  o Soil Vapor Surv.
  o Sampling
(√) Uneven terrain
( ) Trench/excavation collapse

( ) Projectiles
(√) Physical Exertion
( ) Noise (>85 dBA)
( ) Vehicle Traffic
(√) Fire/Explosion (underline)
  o Flam. Materials
  o Low-lying Areas
  o Fuel lines
( ) Work over water (lagoons, streambeds, ravines, bay ocean)

( ) Confined Space
(√) Biological (plants, rodent viruses, marine species, soilborne or waterborne fungi/bacteria, insects, arachnids, snakes, wild animals)
( ) Electrical (utilities)
(√) Chemical Exposure
(√) Other :Unexploded Ordnance

Control or Protective Measures: (see also Table 4)

(√) Tailgate Meetings
(√) Operator Training

(√) PPE, Level D
( ) Site Control

(√) Air Monitoring
( ) Decontamination

( ) Engineering Controls: ______________________________
( ) SOPs: ______________________________
( ) Other: ______________________________
____
____

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Initial levels of protection have been assigned for this work task based on the potential risk of exposure. Levels may be upgraded or downgraded depending on monitoring data (see Action Levels, Table 5) and site conditions, as determined by the Site Health and Safety Coordinator (SHSC). Any modification to the levels of PPE below must be noted here and documented with a completed ROC form (Appendix 2).

Level Of Protection: ( ) A	( ) C	( ) Modified D	
	( ) B	(√) D	
Respirator: (Level C and above)			
	( ) SCBA, Airline	( ) Purif. Resp.	( ) Escape Mask
	( ) OV/AG Cart.	( ) Other ____________	
Protective Clothing:	( ) Encap. Suit	( ) Tyvek®	( ) PE Tyvek®
	( ) Saranex	( ) Splash Suit	( ) Other ________
Head/Eye/Ear:	(√) Hard Hat	(√) Safety Glasses	( ) Goggles
	( ) Splash Shield	(√) Ear Plugs/Muffs	( ) Other ________
Gloves: (outer)	(√) Nitrile	( ) Neoprene	( ) PVC
(inner)	(√) Latex	( ) Vinyl	( ) Other ________
Footwear:	(√) Steel-toed Leather	(√) Overboots	
	( ) Steel-toed Rubber	( ) Other ____________	

Modifications Permitted: ______________________________
____

Ã = required PPE; * = modifications permitted; † =in case of upgrade.

TASK NAME: IDW MANAGEMENT AND DECONTAMINATION

Potential Hazards: (Check all that apply to either existing conditions or that result from site operations)

( ) Rotating Machinery
(√) Heat Stress
( ) Cold Stress
(√) Heavy Equipment
( ) Intrusive Activ's (underline)
- Trenching
- Drilling
- Soil Vapor Surv.
- Sampling

( ) Uneven terrain
( ) Trench/excavation collapse

( ) Projectiles
(√) Physical Exertion
( ) Noise (>85 dBA)
( ) Vehicle Traffic
( ) Fire/Explosion (underline)
- Flam. Materials
- Low-lying Areas
- Fuel lines

( ) Work over water (lagoons, streambeds, ravines, bay ocean)

( ) Confined Space
( ) Biological (plants, rodent viruses, marine species, soilborne or waterborne fungi/bacteria, insects, arachnids, snakes, wild animals)
( ) Electrical (utilities)
(√) Chemical Exposure
( ) Other (List)

Control or Protective Measures: (see also Table 4)

(√) Tailgate Meetings
( ) Operator Training
(√) PPE, Level mod D
( ) Site Control
( ) Air Monitoring
(√) Decontamination
( ) Engineering Controls: __________
( ) SOPs: __________
( ) Other: __________

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Initial levels of protection have been assigned for this work task based on the potential risk of exposure. Levels may be upgraded or downgraded depending on monitoring data (see Action Levels, Table 5) and site conditions, as determined by the onsite health and safety coordinator (SHSC). Any modification to the levels of PPE below must be noted here and documented with a completed ROC form (Appendix 2).

Level Of Protection:	( ) A	( ) C ( ) B	(√) Modified D ( ) D	
Respirator: (Level C and above)		( ) SCBA, Airline ( ) OV/AG Cart.	( ) Purif. Resp. ( ) Other Cart. ______	( ) Escape Mask
Protective Clothing:		( ) Encap. Suit ( ) Saranex	(√) Tyvek® ( ) Splash Suit	( ) PE Tyvek® ( ) Other ______
Head/Eye/Ear:		( ) Hard Hat ( ) Splash Shield	(√) Safety Glasses ( ) Ear Plugs/Muffs	( ) Goggles ( ) Other______
Gloves: (outer)		(√) Nitrile	( ) Neoprene	( ) PVC
(inner)		(√) Latex	( ) Vinyl	( ) Other ______
Footwear:		(√) Steel-toed Leather ( ) Steel-toed Rubber	(√) Overboots ( ) Other______	

Modifications Permitted: __________

Ã = required PPE; * = modifications permitted; † =in case of upgrade.

4.0 SITE CONTROL

4.1 VISITOR ACCESS:

All site visitors (except OSHA inspectors) must receive prior approval from the FM, PM, and client, and may do so only for the purposes of observing site conditions or operations. Upon arrival, visitors will report to the SHSC where he/she will receive and sign the Visitor H&S Orientation Form. All visitors, regardless of their rank or professional level, will not be allowed into controlled work areas unless training and medical requirements have been met and documented.

4.2 WORK ZONES:

(See Figure 3 for suggested zone demarcations, use site map as the base map).

Support/Clean Zone (SZ/CZ):

The SZ/CZ will be upwind or crosswind and away from the contaminated area. Vehicles, emergency equipment, the telephone and break area, and any nonessential personnel will be maintained in this area.

Contamination Reduction Zone (CRZ):

Two separate decontamination lines shall be established for personnel and sampling equipment in the CRZ. The CRZ should be marked as narrow corridors through which personnel and equipment pass from the EZ to the SZ/CZ.

Transition Zone (TZ):

An additional buffer or TZ will be established upwind or crosswind of the contaminated zones and serve as support for sample QA/QC and packing. Coolers in this zone will be protected from contamination using polyethylene sheeting and decontaminated prior to leaving the site.

Exclusion Zone (EZ):

The EZ is defined as an area with an approximately 30-foot radius around intrusive activities. Access should be restricted to field sampling crews and necessary equipment operators.

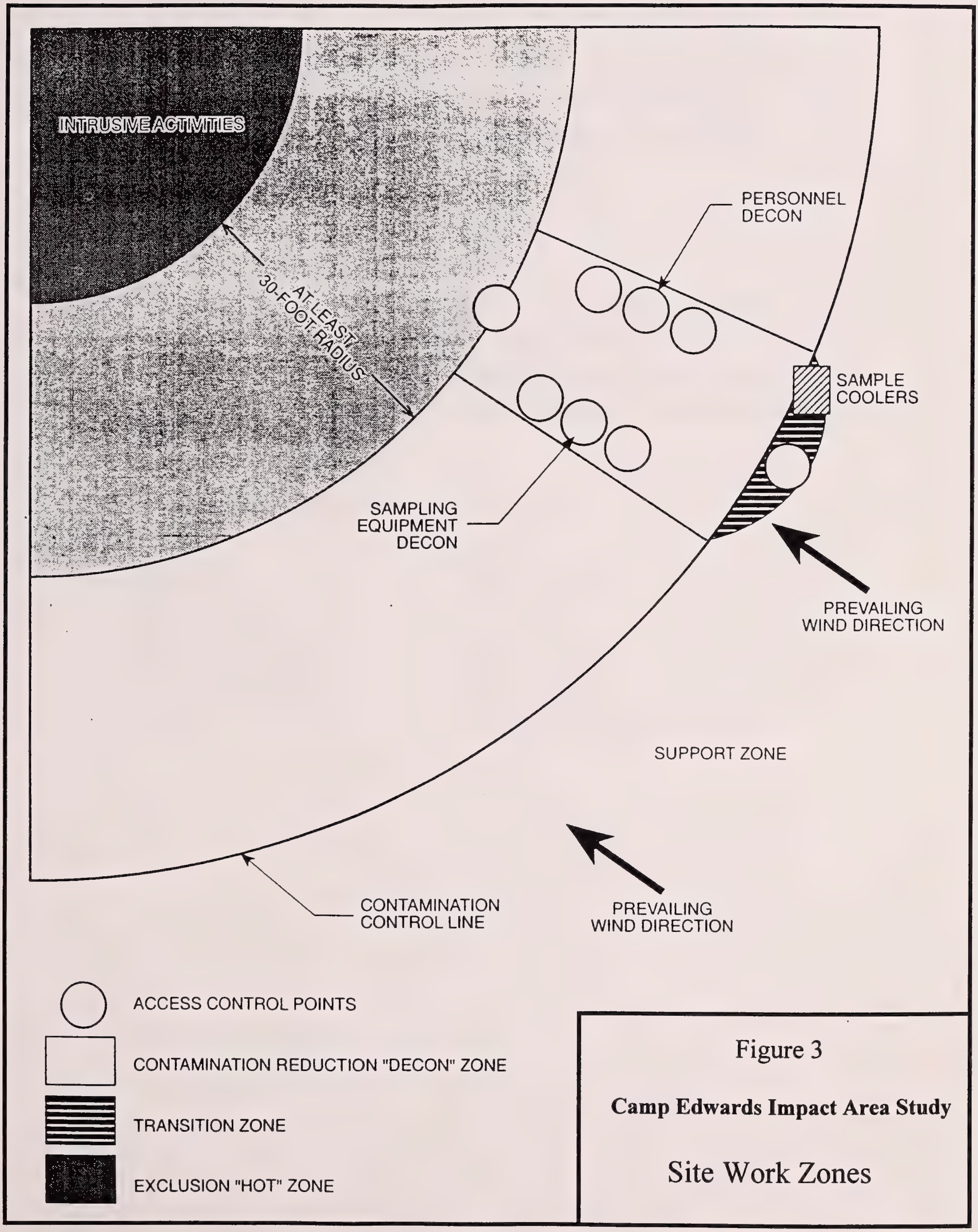


Figure 3

Camp Edwards Impact Area Study

Site Work Zones

4.3 SITE SECURITY:

Access will be limited to all controlled areas via the prescribed administrative (certifications) and engineering (barricades) controls. All site staff and visitors will note arrival and departure times on the Employee/Visitor Roster. All equipment, tools, and property shall be secured at the end of the day.

4.4 COMMUNICATIONS:

The "buddy system" will be enforced for field activities involving potential exposure to hazardous or toxic materials, and during any work within the exclusion zone. Each person will observe his/her buddy for symptoms of chemical or heat overexposure and provide first aid or emergency assistance when warranted. A mobile phone will be maintained onsite for emergency use.

The following emergency hand signals will be used:

Thumbs up = OK; understand
Thumbs down = No; negative
Grasping buddy's wrist = Leave site now
Hands on top of head = Need assistance
Horn - one long blast = Evacuate site
Horn - two short blasts = All clear, return to site

5.0 SANITATION AND ILLUMINATION

Potable drinking water shall be supplied in tightly closed containers and shall be clearly marked for its intended use. If vehicles are available for use by field crews, restrooms and a field washing area with potable water will be available within a reasonable distance from the site. If such facilities are not located within a reasonable distance, portable facilities will be installed for use by field employees. If the nature of the project is mobile and of a duration less than 6 months, no permanent onsite shower/change facility will be provided.

It is anticipated that all site work will be conducted during daylight hours. If circumstances arise in which field work is to be conducted before or after daylight, or sunlight is obstructed, illumination within all general site areas will be maintained at or above 5 foot-candles for general site areas.

6.0 AIR SURVEILLANCE

6.1 TYPE AND FREQUENCY OF MONITORING:

TYPE	MINIMUM RECOMMENDED FREQUENCY
Background:	Once per day in the work area and perimeter using direct-reading instruments, prior to any intrusive activities or equipment startup.
Perimeter:	Once per hour using direct-reading instruments during intrusive activities.
Personnel:	At least twice per day in the breathing zone of those with the highest anticipated exposure during intrusive activities.
Area:	At least twice per day in each work zone and at the onset of any new intrusive activities, or at new locations.
Environmental:	Periodic field screening of selected samples as per the Sampling and Analysis Plan.

6.2 MONITORING INSTRUMENTS:

The SHSC will maintain equipment SOPs (Appendix 3) onsite that specify calibration, general use, and troubleshooting procedures. All monitoring equipment will be field calibrated on a daily basis according to the manufacturers instructions, and will be recorded on the calibration log (Appendix 2).

EQUIPMENT	CONTAMINANT	WORK ACTIVITY
FID	VOC	Drilling, UXO clearance, and Soil Sampling
MiniRAM	Metals and Explosives	Drilling and UXO clearance
Noise Dosimeter	Noise	Drilling, Development, Water sampling, Road Building

6.3 ACTION LEVELS:

Action levels should be established for upgrading/downgrading PPE, work stoppages, and evacuation (see Appendix 5 for justification of Action Levels Calculations). The decision to upgrade/downgrade the level of PPE must be based upon instrument readings measured in the breathing zone of site personnel and comparison of the results to the information contained in Table 5. Record readings on Air Surveillance Record forms in Appendix 2.

Table 5

ACTION LEVELS

EQUIPMENT	ACTION LEVEL	ACTION TO BE TAKEN
MIE MiniRAM PDM3	2 mg/m3	Stop work in Level D. Notify Field Program Manager. Work conditions will be evulated to determine if upgrade to Level C is necessary.
Flameionization Detector	25 ppm	Stop work in Level D. Notify Field Program Manager. Work conditions will be evulated to determine if upgrade to Level C is necessary.
Noise Dosimeter	85 Db TWA	Hearing protection required

7.0 DECONTAMINATION PROCEDURES

(Procedures for the decontamination of sampling tools and other related equipment are specified in the sampling plan. Note that separate areas should be established for personnel, sampling, and heavy equipment decontamination, see also the Engineering Controls of this HSP and Decontamination SOP).

7.1 PERSONNEL DECONTAMINATION:

Equipment:

Long-handled soft-bristled brushes, galvanized washtubs or equivalent, pump-activated sprayer, garbage cans with plastic liners and drums with liners, visqueen, paper towels, and duct tape.

Decon Solution:

Liquinox (biodegradable lab-grade detergent); tap water for rinsing.

Procedures:

Two stages of decon have been designated:

1) **Intermediate**: For periodic exits out of the exclusion zone during sample transport and management, or for short heat stress mitigation breaks.

> *Steps*: Outer boot and glove wash with Liquinox solution, outer boot and glove rinse, removal of outer glove and storage for later use, entering transition zone for sample management, return to exclusion zone wearing new or cleaned outer gloves.

2) **Final**: For use prior to taking cool down breaks, lunch, and exiting the site.

> *Steps*: Segregated equipment drop (for instruments and equipment requiring special decon as outlined in the sampling plan), outer boot and glove wash with a Liquinox solution, outer boot and glove rinse, removal or disposal of outer boots, removal and disposal (if not cleaned to "like new" condition) of outer gloves, removal and disposal of coverall, removal and disposal of inner gloves in

designated receptacles, and general field wash for personal hygiene. Exit to support zone.

7.2 EQUIPMENT DECONTAMINATION:

All equipment that will potentially contact samples will be decontaminated prior to, and following, sampling events according to procedures specified in the sampling plan and field procedure. Heavy equipment in direct contact with soil and/or ground water, such as the drill rig augers and backhoe buckets, shall be steam cleaned onsite and inspected by the PM or FM prior to leaving the site. The permanent decon area (for steam cleaning) will be located in the vicinity of Range Control, and will be constructed by the drilling subcontractor (see also Engineering Controls). Temporary decon stations (bucket wash) will be located near work areas and will be positioned upwind or crosswind of operations.

7.3 DISPOSAL PROCEDURES:

All discarded materials that accumulate from onsite activities (PPE, decon fluids, supplies, etc.) will be segregated by matrix and by source location; placed in labeled, DOT-approved, 55-gallon drums; and stored in a secure, designated location onsite as determined by the ARNG. Analytical results will be evaluated prior to disposal. All IDW will be handled, labeled, stored, inventoried and disposed of in accordance with the IDW SOP.

8.0 EMERGENCY ACTIONS

8.1 PREPLANNING AND GENERAL PROCEDURES:

General Emergency Information:

Site personnel should be constantly alert to recognize potentially unsafe work practices, hazardous work environments, and IDLH conditions, and they should be routinely reminded of signs and symptoms of chemical and heat overexposure. Emergency response procedures (this section) should be reviewed daily; and should be updated, as necessary, following incidents. Prearrange access for emergency crews when necessary.

In the event of a large-scale spill, fire/explosion, or major emergency, the FM is expected to notify the PM; PM notifies the client, evacuates the area, and lets appropriately trained emergency staff respond to the situation. The safety and well-being of site personnel, visitors, and the adjacent community will be of utmost importance in determining the appropriate response to a given emergency. An Employee Emergency Action and Fire Prevention Plan has been prepared in accordance with OSHA 29 CFR 1910.38; annual training is required for all OEES personnel.

Emergency Coordinator (EC):

The PM or FM will serve as the EC during an actual emergency response situation. The PM or FM will serve as the primary EC at all times; first-aid and rescue duties are shared between the first-aid/CPR trained team members. All foreseeable first-aid and rescue equipment should be stored onsite in an accessible area. The EC will contact offsite emergency response agencies and serve as the main spokesperson when the responders arrive onsite.

Site Maps:

An updated site map (see Site Control, Section 5.0) that is used during daily tailgate meetings will be used to inform the staff of hazardous areas, zone boundaries, site terrain, evacuation routes, work crew locations, and any site changes. In the unlikely event that an emergency occurs, the problem areas will be pinpointed on the site map, and pertinent information, such as weather and wind direction, temperature, and forecast, will be added as obtained. This map will be provided to the responding agencies.

Emergency Decontamination:

For first aid of non-life-threatening injuries, evacuate to decontamination line and decontaminate as much as possible or practical; contaminated clothing should be removed. For life-threatening injuries/exposures, field decontaminate as much as possible for his/her own safety, wrap in a blanket or polyethylene sheeting, and immediately transport to the designated medical facility. Also, phone ahead and bring this HSP for informational purposes and MSDS access by medical staff (see Emergency Response).

Safe Refuge Area:

TBD and will be discussed in the tailgate meetings by the ECs daily, once onsite. It will be set up in the Support Zone or at an offsite location in the event of a sitewide evacuation. This area will be upwind, and the location and escape routes will be designated on site control maps. It will contain emergency equipment, escape route maps, communications and the Emergency Reference (call) List. This is required for all phases of work. In an emergency, the EC (PM or FM) will take a "headcount" against the Employee/Visitor Daily Roster (Appendix 2), initiate search/account for missing persons, notify the emergency crews (as applicable), and limit access into the hazardous emergency area to necessary rescue and response personnel in order to prevent additional injury and possible exposures.

Emergency Equipment:

Maintained in field vehicle (V), in the Clean Zone (CZ), except for * items that will be kept in the Exclusion Zone (EZ) and as applicable in the field trailer (FT). All items must be checked and maintained by the SHSC at least weekly and after each use.

(√) First-aid Kit, V/FT
( ) SCBA, V/FT
( ) Spill Equipment, V
(√) Two-way Radio
(√) Fire Extinguisher, V/EZ
( ) Escape Packs
( ) Mobile Phone, V/FT
(√) Hospital Route Map, V/FT
( ) Field showers, FT or V
( ) Alarms*, V/EZ
( ) Fire Blanket*, V/EZ

Evacuation Procedures:

Expeditious evacuation routes to the safe refuge area(s) will be established daily for all work area locations, with respect to the wind direction. Evacuation notification will be a

continuous blast on a canned siren, vehicle horn, or direct verbal communication. Emergency drills should be performed periodically; update plan.

In the unlikely event that an evacuation is necessary, all personnel will immediately proceed to the predetermined safe refuge area, decontaminating to the extent possible for personal safety, based on the emergency. The EC should then begin the Site Security and Control Measures.

8.2 SITE-SPECIFIC RESPONSE SCENARIOS:

8.2.1 Natural Disasters

Hurricanes

"Watch" conditions indicates a 36-hour notification of approaching storm. "Warning" condition indicates 24-hour notification of approaching storm and mandates an evacuation out of the "Danger Zone" as indicated by CD Bulletins.

Acton: Notify all personnel; refer to Action Plan; secure site, equipment/tools and IDW areas; remove and copy irreplaceable documents; disconnect power sources, evacuate to safe shelter or Hotel. Personnel are allowed to continue work on the site only to the extent of preparing for the storm, and only if favorable conditions exist.

Weather-Related Emergencies:

All work will cease should any of the following weather conditions arise:

- Poor visibility
- Precipitation severe enough to impair safe movement/travel
- Lightning in the immediate area
- Winds in excess of 40 miles per hour
- Flooding
- Other conditions as determined by the SHSC, or PM or FM

Fire or Explosion:

Sound the emergency alarm (continuous blast on a canned siren, vehicle horn, or direct oral communication) to summon the EC who will decide whether to call the Fire

Department for outside assistance (see Preplanning). Small-scale fires (less than one-half of the responder's height) should be extinguished with an accessible, ABC fire extinguisher by any team member who has received training. Fires in boreholes may be smothered with a fire blanket. Trained emergency crews will be summoned to control any large-scale or potentially unmanageable incident. Any offsite responding agencies will be given the Site Map and briefed about the site-specific hazards so that they can be optimally helpful in an emergency situation. The EC will evacuate all nonresponse personnel and visitors to the Safe Refuge Area; will notify the PM, as applicable, the client, and the OEES HSM (see call list); and will complete the appropriate reports.

See also Table 3 of this HSP, and the OEES Emergency Action Plan.

8.3 MEDICAL EMERGENCY RESPONSE

(See Hospital Route Map, Figure 4.)

HOSPITAL NAME:	**HOSPITAL ADDRESS:**
Falmouth Hospital	100 Ter Huen Avenue, Falmouth, MA 02540
HOSPITAL TELEPHONE:	**DIRECTIONS:**
508-548-5300	Enter rotary at the main gate and get onto Highway 28 toward Falmouth; go to traffic light at Ter Huen Avenue; turn right onto Ter Huen Avenue. Falmouth Hospital is on the left.

Hospital Route:

Direction from the Main Gate: Exit base on North Connery Ave: at the main gate, enter the rotary and proceed approximately 300 degrees around the rotary onto route 28 toward Falmouth. At the first set of lights, turn right onto Tern Huen Road. The Falmouth Hospital will be on the left.

Directions from the Falmouth Gate: Exit base on East Inner Road; turn right at the Falmouth Gate onto Sandwich Road. Take a right on Route 151 to Route 28 toward Falmouth. At the first set of lights, turn right onto Ter Huen Road. The Falmouth Hospital will be on the left.

Site Personnel Response Actions:

Sound emergency alarm (continuous blast on a vehicle horn, or direct verbal communication) to summon the ECs who will assess the situation, taking first necessary

precautions for personal safety. The ECs will determine whether to transport the injured party to the Falmouth Hospital, or summon an ambulance by calling 548-2323 (see Preplanning). The Site Control Measures will be implemented. Any offsite responding agencies will be given the Site Map and informed about the site-specific hazards so that they can be optimally helpful in an emergency situation.

The EC will direct that the employees responding follow the Emergency Decon procedures and provide first aid to the extent possible while awaiting medical attention. In emergencies, the injuries and illnesses that may arise will vary from incident to incident; check Tables 2 and 3 and the MSDSs (Appendix 1) or contact the Poison Control Center for emergency first-aid procedures. Medical treatment may range from bandaging of minor cuts and abrasions to lifesaving techniques; therefore, first-aid/CPR training is required for all OEES staff. The SHSC will serve as the primary caregiver and bloodborne pathogen officer (see also Bloodborne Pathogen Control Plan), but these duties are shared between qualified team members. It is essential that all site personnel in need of emergency care receive treatment. Appropriate documentation and notification will be discussed later in this section.

8.3.1 Bloodborne Pathogen Exposure Control Plan

Exposure Determination:

First-aid responders have the potential to be exposed to bloodborne pathogens. The potential for exposure to bloodborne pathogens outside of emergency response is not anticipated.

Exposure Control

Universal Precautions:

Use of the Center for Disease Control "Universal Precautions" as an approach to infection control, which assumes that all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, and other bloodborne pathogens.

Personal Protection Equipment:

While rendering first aid where exposure to blood may occur, OEES employees will don, at a minimum, latex or blue nitrile gloves. Latex gloves will be available in the field

first-aid kit in a packet. Other items included in the packet that are to be used to control the "spill" are absorbent beads, a plastic scooper, a biohazard bag for waste, and surface disinfecting and hand-cleaning towelettes. Other suggested PPE in the event of a serious blood-producing injury includes safety glasses, Tyvek® coveralls, boot covers, and nitrile outer gloves – all of which should be available onsite. In addition, a disposable, one-way CPR mask to prevent direct contact between the rescuer and recipient will also be available in the first-aid kit should the need arise.

Hepatitis B Vaccination:

First-aid providers to jobsite injuries do not need to receive a preexposure Hepatitis B vaccine but are encouraged to do so. All first-aid providers assisting in any exposure incident must be offered the full Hepatitis B immunization series no later than 24 hours after an incident. In Falmouth, this immunization series can be obtained by calling the Falmouth Hospital or going directly to the clinic at 100 Ter Huen Avenue, Falmouth, MA.

Exposure Incident Evaluation:

All first-aid incidents involving exposures must be reported to the HSM or PHSM before the end of the work shift in which the incident occurs. A First-aid Incident Report (Appendix 2) must be completed describing the circumstances of the accident and response in addition to the Supervisor's Report of Injury or Illness form. Following a report of an exposure incident, OEES shall provide to the exposed employee monitoring for HIV or HBV antibodies and medical counseling in cases of positive tests for HIV or HBV.

Waste Disposal:

Should biohazardous waste be generated as a result of a field related injury, the "contaminated" waste and area will be cleaned to the extent possible with items provided in the packet, and arrangements for the pickup and final disposal of the waste will be made by calling the appropriate waste hauller.

HBV Vaccination Declination:

For whatever reason (religious, personal, or otherwise), employees may decline or refuse the HBV vaccination by contacting the HSM or PHSM. In instances where the vaccination is required, the employee will be required to sign a waiver (Appendix 2)

indicating he/she has chosen at that time to refuse the vaccination, but may elect to receive it in the future at no expense to him/her.

8.4 SPILL OF HAZARDOUS MATERIALS

There is a low probability of small quantity spillage/leakage of hazardous materials (fuels, grouts, detergents) that are brought onsite to implement site activities. These materials will be properly stored, and the appropriate spill response equipment will be located, or easily accessible to, the area where the materials are used/stored. In case of a spill, notify the SHSC and PM or FM, select appropriate PPE and response equipment, contain the spill to the extent possible, neutralize or contain the liquid as per the MSDS, transfer to an IDW container, document with an Incident Report (Appendix 2), and notify the FM or PM and client, as appropriate.

8.5 ACCIDENT REPORTING AND RECORD KEEPING

The SHSC will contact the HSM or PHSM and conduct an investigation jointly with the PM or FM. The FM or PM will complete the Supervisor's Report of Injury or Illness and First-aid Incident Report (Appendix 2). These completed reports must be transmitted to the HSM within 24 hours of an occurrence; a fax is acceptable. The HSM or PHSM will submit the appropriate reports to the OEES Human Resources department (for Workers' Compensation), the CHSD (according to the Accident Reporting SOP), and OSHA (as applicable).

The foreman or field supervisor of subcontracting crews will investigate and complete an injury/illness report (similar in content to the OEES report) in accordance with their internal company policy. This report must be transmitted to the OEES HSM or PHSM within 24 hours.

In case of environmental incidents, property damage, power disruption, or mandated work "shutdowns," an Incident Report (Appendix 2) will be prepared by the FM or PM. Any damage, loss, or theft of OEES property (items/tools/equipment) will be reported to the office HSC.

Any release of information to unauthorized persons or agencies in these reports is prohibited unless it is first approved by the client. Certain agencies or persons, such as OSHA or OSHA inspectors, can request this information and its release will be permitted. Review the Emergency Call List for additional contact names and phone numbers.

8.6 EMERGENCY REFERENCE LIST

(Keep posted in vehicles and near communication system)

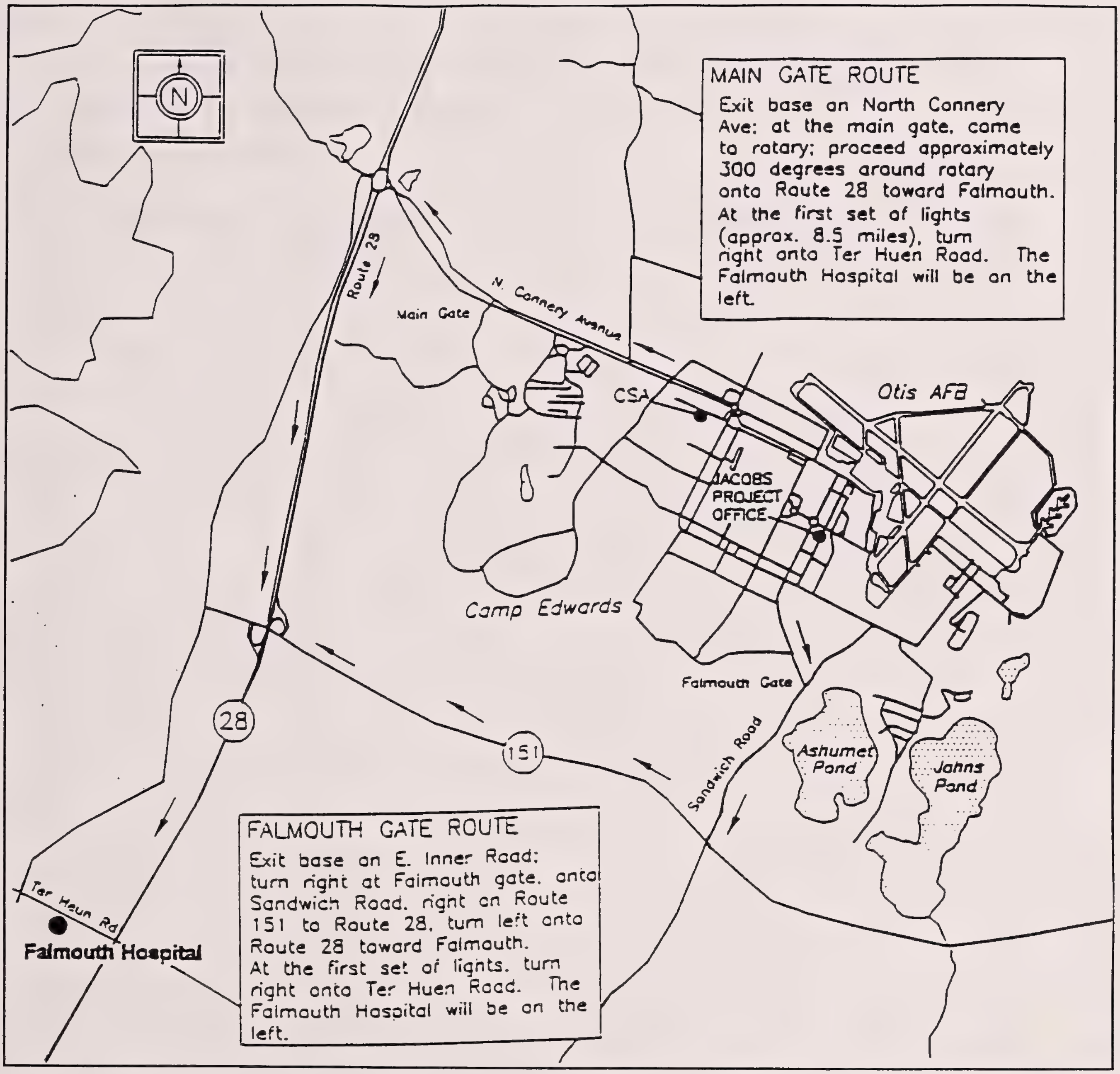
RESPONDING EMERGENCY AGENCIES

SERVICE	TELEPHONE NUMBER
MMR Ambulance	508-968-4111
MMR Fire Department	508-968-4117
MMR Police Department	508-968-4222
Ambulance	508-548-2323
Fire Department	508-548-2323
Police Department	508-548-1212
Falmouth Hospital	508-548-5300
Poison Control Center	1-800-962-1253
State Police	508-759-4488

OEES CALL LIST:

TITLE	NAME	TELEPHONE NUMBER
HSM or Project Health and Safety Manager	John Rice	508-692-9090
Corporate Health and Safety Director	Denise Daggett	619-458-9111 x328
Project Manager	Marc Grant	508-692-9090
Site HSC	C. Peter Desrocher	508-692-9090
Client	Captain James Boggess	
State or Federal OSHA Office		617-565-7164
CHEMTREC		1-800-424-9300

* In the event of an occupational accident or incident, please indicate to the medical facility that this is a Workers' Compensation case (Plan ID #110485/02715); that your employer is OEES Allied; and that the insurance carrier is Alexsis, Inc. Also submit a Medical Treatment Authorization form Appendix 2, with the SHSC's authorized signature. Subcontractors will provide internal Workers' Comp. policy information; this should be provided to the SHSC at the prework meeting.



MAIN GATE ROUTE

Exit base on North Connery Ave; at the main gate, come to rotary; proceed approximately 300 degrees around rotary onto Route 28 toward Falmouth. At the first set of lights (approx. 8.5 miles), turn right onto Ter Huen Road. The Falmouth Hospital will be on the left.

FALMOUTH GATE ROUTE

Exit base on E. Inner Road; turn right at Falmouth gate, onto Sandwich Road, right on Route 151 to Route 28, turn left onto Route 28 toward Falmouth. At the first set of lights, turn right onto Ter Huen Road. The Falmouth Hospital will be on the left.

Map is a modification of Jacobs Engineering Hospital Route Map

Figure 4

Camp Edwards Impact Area Study

Hospital Route Map

9.0 HEALTH AND SAFETY PLAN ACCEPTANCE

I have had the opportunity to read and ask questions about this HSP. My signature certifies that I understand the procedures, equipment, and restrictions of this plan and agree to abide by them.

SIGNATURE*	PRINTED NAME	COMPANY	DATE

* This acceptance form is required for all routine site staff and subcontracting personnel. Visitors and non-routine subcontractors are required to receive and sign the appropriate Health and Safety Orientation Form located in Appendix 2.

APPENDIX 1

MSDSs AND SELECTED DATA SHEETS

BIG THREE INDUSTRIES, INC.
P. O. BOX 3047
HOUSTON, TX 77253

PURCHASE ORDER VERBAL

MATERIAL SAFETY DATA SHEET

I - GENERAL INFORMATION

PRODUCT NAME AIR

EMERGENCY TELEPHONE NO. 713-868-0302
MANUFACTURERS NAME BIG THREE INDUSTRIES, INC.
TRADE NAME/SYNONYMS AIR, COMPRESSED AIR, BREATHING AIR, AIR USP
CHEMICAL NAME AND SYNONYMS
AIR
REVISION DATE: 08/22/89 PRODUCT ID. UN 1002 FORMULA NONE
CHEMICAL FAMILY NONE CAS FAMILY N/A

********** SECTION NOTES **********

MSDS INFORMATION NUMBER: (713) 896-2140

II - HAZARDOUS INGREDIENTS

HAZARDOUS MIXTURES OF LIQUIDS AND GASES	0/0	TLV
NITROGEN	78.0	N/A
OXYGEN	20.9	N/A
ARGON	0.9	N/A
.	.	.

III - PHYSICAL DATA

BOILING POINT -317.8F (-194.3C) @ 1 ATM
SPECIFIC GRAVITY (AIR = 1): 1.0 @ 70 F (21.1 C) & 1 ATM
VAPOR PRESSURE N/A
PERCENT VOLATILE BY VOLUME (0/0) N/A (GAS)
DENSITY 0.07493 LB/CU FT @ 70 F (21.1 C) & 1 ATM
EVAPORATION RATE N/A (GAS
SOLUBILITY IN WATER 2.92SCC/100CC H2O @ 32 F (0 C)
MATERIAL AT NORMAL CONDITION GAS
EXPANSION RATIO (LIQUID TO GAS) N/A (GAS)

APPEARANCE AND ODOR

COLORLESS, ODORLESS, TASTELESS GAS

IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT N/A
FLASH POINT (METHOD USED)
FLAMMABILITY LIMITS IN AIR (0/0 BY VOL) LOWER N/A UPPER N/A

EXTINGUISHING MEDIA

MATERIAL IS NONFLAMMABLE. USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE FIGHTING PROCEDURES

NONE. IF POSSIBLE, REMOVE AIR CYLINDERS FROM FIRE AREA OR COOL WITH WATER TO AVOID EXCESSIVE PRESSURE BUILDUP.
.

UNUSUAL FIRE AND EXPLOSION HAZARD

PRESSURE CAN BUILD UP DUE TO HEAT AND CYLINDER MAY EXPLODE IF PRESSURE RELIEF DEVICES SHOULD FAIL TO RELIEVE PRESSURE. COMPRESSED AIR AT HIGH PRESSURES WILL ACCELERATE THE BURNING OF MATERIALS.

.

AUTOIGNITION TEMPERATURE: N/A

ELECTRICAL CLASSIFICATION: NONHAZARDOUS

.

V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE	NONE ESTABLISHED
UNUSUAL CHRONIC TOXICITY	*SEE OVEREXPOSURE SECTION*
CARCINOGENICITY	NOT LISTED BY IARC, NTP, OR OSHA
ROUTES OF EXPOSURE	INHALATION

EFFECTS OF OVEREXPOSURE

NONE.

TOXICOLOGICAL PROPERTIES:

AIR IS NONTOXIC AND NECESSARY TO SUPPORT LIFE.

.

EMERGENCY AND FIRST AID PROCEDURES

NONE.

.

VI - REACTIVITY DATA

STABILITY STABLE

CONDITIONS TO AVOID

NONE

INCOMPATABILITY (MATERIALS TO AVOID)

NONE.

.

HAZARDOUS DECOMPOSITION PRODUCTS

NONE.

HAZARDOUS POLYMERIZATION WILL NOT OCCUR

CONDITIONS TO AVOID

NONE

VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

SHUT OFF SOURCE OF AIR, IF POSSIBLE. IF LEAKING FROM CONTAINER OR VALVE, CONTACT THE CLOSEST BIG THREE INDUSTRIES LOCATION, OR YOUR SUPPLIER.

WASTE DISPOSAL METHOD

DO NOT ATTEMPT TO DISPOSE OF RESIDUAL OR UNUSED QUANTITIES. RETURN TO YOUR SUPPLIER FOR DISPOSAL.

VIII-SPECIAL PROTECTIVE INFORMATION

RESPIRATORY PROTECTION (SPECIFY TYPE)

NONE REQUIRED.

VENTILATION

NONE

PROTECTIVE GLOVES

N/A

EYE PROTECTION

SAFETY GLASSES ARE RECOMMENDED WHEN HANDLING HIGH PRESSURE CYLINDERS.

OTHER PROTECTIVE EQUIPMENT

SAFETY SHOES WHEN HANDLING CYLINDERS.

IX-SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

STORE AND USE WITH ADEQUATE VENTILATION. CYLINDERS SHOULD BE STORED UPRIGHT WITH VALVE PROTECTION CAP IN PLACE AND FIRMLY SECURED TO PREVENT FALLING OR BEING KNOCKED OVER. PROTECT CYLINDERS FROM PHYSICAL DAMAGE; DO NOT DRAG, ROLL, SLIDE, OR DROP. USE A SUITABLE HAND TRUCK FOR CYLINDER MOVEMENT. DO NOT ALLOW THE TEMPERATURE WHERE CYLINDERS ARE STORED TO EXCEED 125 F (52 C).

D.O.T. LABELING

NONFLAMMABLE GAS - GREEN LABEL

VALVE CONNECTION

346 OR 950 (PIN INDEXED)

OTHER PRECAUTIONS

NEVER STRIKE A WELDING ARC ON ANY COMPRESSED GAS CYLINDER. REFILLING CYLINDERS WITHOUT THE CONSENT OF THE CYLINDER OWNER IS A VIOLATION OF FEDERAL LAW (49 CFR).

DOT PLACARD: NONFLAMMABLE GAS.

MATERIAL SAFETY DATA SHEET

ODUCT NAME AIR

DOT PROPER SHIPPING NAME: AIR; OR AIR, COMPRESSED

MISCELLANEOUS INFORMATION:

FURTHER INFORMATION ABOUT AIR CAN BE FOUND IN THE FOLLOWING PAMPHLETS PUBLISHED BY:

THE COMPRESSED GAS ASSOCIATION
1235 JEFFERSON DAVIS HIGHWAY
ARLINGTON, VA 22202
(713) 979-4341

G-7.1: "COMMODITY SPECIFICATION FOR AIR"
G-7: "COMPRESSED AIR FOR HUMAN RESPIRATION"
P-1: "SAFE HANDLING OF COMPRESSED GASES IN CONTAINERS"

COMPRESSED AIR IS PRODUCED BY BIG THREE THROUGH COMPRESSION AND FILTRATION OF ATMOSPHERIC AIR.

NFPA RATINGS:
HEALTH: 0
FLAMMABILITY: 0
REACTIVITY: 0

HMIS RATINGS:
HEALTH: 0
FLAMMABILITY: 0
REACTIVITY: 0

CERLCA RATINGS:
HEALTH: 0
FIRE: 0
REACTIVITY: 0
PERSISTANCE: 0

LISTED IN TSCA INVENTORY: YES

THIS PRODUCT SAFETY DATA SHEET IS OFFERED SOLELY FOR YOUR INFORMATION, CONSIDERATION, INVESTIGATION, IN COMPLIANCE WITH HAZARD COMMUNICATION STANDARD 29 CFR 1900.1200. BIG THREE INDUSTRIES, INC. PROVIDES NO WARRANTIES, EITHER EXPRESS OR IMPLIED.

CIBA CORNING DIAGNOSTICS UK LIMITED
NORTHERN ROAD
CHILTON INDUSTRIAL ESTATE
SUDBURY
SUFFOLK
CO10 6XD
ENGLAND
EMERGENCY PHONE: 011-44-787-880022
DATE: 06/01/89

SECTION 1. IDENTIFICATION--
PRODUCT NAME: CONDUCTIVITY STANDARD 1413 MICRON S
PART NUMBER: 473623
CHEMICAL FAMILY/PRODUCT TYPE: AQUEOUS BASED SALT SOLUTION

SECTION 2. COMPOSITION---
CHEMICAL NAME: THIS PRODUCT IS LABELED IN ACCORDANCE WITH REGULATIONS OF THE FOOD AND DRUG ADMINISTRATION AND CONTAINS CHEMICAL SUBSTANCES THAT ARE EITHER NOT HAZARDOUS OR ARE AT CONCENTRATIONS BELOW THAT REQUIRED FOR PREPARATION OF A MATERIAL SAFETY DATA SHEET AND THEREFORE MEETS THE REQUIREMENTS OF THE OSHA HAZARDOUS COMMUNICATION STANDARD 29 CFR 1910.1200.

SECTION 3. PHYSICAL DATA---
NO DATA GIVEN.

SECTION 4. FIRE AND EXPLOSION DATA-------------------------------
NO DATA GIVEN.

SECTION 5. HEALTH AND HAZARD DATA--------------------------------
NO DATA GIVEN.

SECTION 6. REACTIVITY DATA---------------------------------------
NO DATA GIVEN.

SECTION 7. SPILL AND DISPOSAL PROCEDURES-------------------------
STEPS TO BE TAKEN IN CASE OF LEAKS OR SPILLS: WASH AWAY WITH COPIOUS QUANTITIES OF WATER.
WASTE DISPOSAL METHOD: DISPOSE IN DOMESTIC OR INDUSTRIAL WASTE WATER SYSTEM.

SECTION 8. PERSONAL PROTECTION INFORMATION-----------------------
NO DATA GIVEN.

SECTION 9. SPECIAL PRECAUTIONS-----------------------------------
NO DATA GIVEN.

SECTION 16. OTHER INFORMATION------------------------------------
THIS INFORMATION IS INTENDED ONLY AS GUIDANCE FOR APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL AND IS BELIEVED TO BE ACCURATE. THE UNIVERSITY SYSTEM OF GEORGIA RIGHT TO KNOW PROGRAM

PROVIDES NO GUARANTEE OF THE ACCURACY OR COMPLETENESS OF THE DATA AND SHALL NOT BE LIABLE FOR ANY DAMAGES. USERS OF THIS PRODUCT ARE RESPONSIBLE FOR INVESTIGATING AND VERIFYING THE PRECAUTIONS AND DANGERS INVOLVED IN THE APPLICATION THAT THEY HAVE CHOSEN. FEDERAL, STATE, MUNICIPAL, AND INSURANCE REQUIREMENTS, AND NATIONAL SAFETY CODES MUST BE FOLLOWED AND ARE NOT TO BE CONFUSED WITH THE PRECAUTIONARY DATA.

LAST PAGE.

AMEREX

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards[1]

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED):	**ABC DRY CHEMICAL**
SYNONYMS:	**Multi-Purpose Dry Chemical**
MANUFACTURER'S NAME:	AMEREX CORPORATION
ADDRESS:	P.O. BOX 81 Trussville, AL 35173-0081
EMERGENCY PHONE:	1-800-424-9300 (CHEMTREC)
BUSINESS PHONE:	(205) 655-3271
DATE OF PREPARATION:	May 24, 1995

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			OTHER
			TLV mg/m³	STEL mg/m³	PEL mg/m³	STEL mg/m³	IDLH mg/m³	
Mono Ammonium Phosphate	7722-76-1	95	ACGIH TLV for Particulates, Not Otherwise Classified = 10; OSHA PEL for Particulates Not Otherwise regulated, Total Dust = 15, Respirable Fraction 5.					
Ammonium Sulfate	7783-20-2							
Mica	12001-26-2	< 3	3 (Respirable Fraction)	NE	3 (Respirable Fraction)	NE	NE	NE
Attaclay	1332-58-6	< 3	NE	NE	NE	NE	NE	NE
Silicone Oil	63148-57-2	< 1	NE	NE	NE	NE	NE	NE
Calcium Carbonate	471-34-1	< 1	ACGIH TLV for Particulates, Not Otherwise Classified = 10; OSHA PEL for Particulates Not Otherwise regulated, Total Dust = 15, Respirable Fraction 5.					
Silica (Precipitated)	112926-00-8	< 1	2	NE	6	NE	NE	NE
Yellow Pigment	5468-75-7	< 1	NE	NE	NE	NE	NE	NE

E = Not Established C = Ceiling Level See Section 16 for Definitions of Terms Used.

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[1] NOTE: all WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This mixture of dry chemicals poses little hazard. Mechanical irritation of the eyes is possible durir the use and maintenance of the extinguishing units. Chronic inhalation of any particulate may damage the lungs.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: Over-exposure to this product may cause mild skin irritatio moderate eye irritation, and possible gastric distress. The product is not known to cause chronic illness.

HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH (BLUE)	1
FLAMMABILITY (RED)	0
REACTIVITY (YELLOW)	0

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8

For routine industrial applications

INHALATION: Inhalation of this product should be avoided, but if it occurs, may cause mild irritation of the nose, throat, and other tissues of the respiratory system.

CONTACT WITH SKIN or EYES: Contact of dust from this product with the eyes may cause moderate irritation, reddening of the affected eye, and discomfort.

SKIN ABSORPTION: No component of this product is known to absorb through the skin.

INGESTION: Ingestion of this product may cause mild gastric distress.

INJECTION: While injection of this product is unlikely, it may occur as a result of a puncture or cut with a sharp object contaminated with the extinguishing agent. Mild symptoms, similar to those of skin irritation may occur.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. This product poses low, acute health risks.

ACUTE: This extinguishing material presents only a slight risk of causing acute health effects. If such effects occur, they will be in the form of mild irritation of the skin, nose, or throat and moderate irritation of the eyes. If ingested, thi product may cause an upset stomach.

CHRONIC: This product is not known to cause any chronic illnesses or diseases.

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

SKIN EXPOSURE: If spilled on skin, immediately begin decontamination with running water. Remove exposed or contaminate clothing, taking care not to contaminate eyes. If reddening or irritation occurs, victim and rescuers must seek immediate medic attention.

EYE EXPOSURE: If chemical is splashed in eyes, open victim's eyes while under gentle running water. Use sufficient force to ope eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes.

INHALATION: If chemical is inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. reddening or irritation occurs, victim and rescuers must seek immediate medical attention.

4. FIRST-AID MEASURES (Continued)

INGESTION: If chemical is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, do not induce vomiting. Victim should drink milk, egg whites, or large quantities of water. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow.

f exposure causes obvious distress, victim(s) and rescuers must be taken for medical attention. Take copy of label and MSDS to hysician or health professional with victim.

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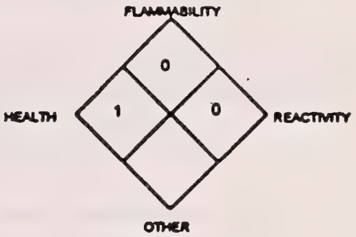
5. FIRE-FIGHTING MEASURES

LASH POINT, °C (method): Not applicable.
UTOIGNITION TEMPERATURE, °C: Not applicable.
LAMMABLE LIMITS (in air by volume, %): Lower (LEL): Not applicable.
Upper (UEL): Not applicable.

NFPA RANKING



IRE EXTINGUISHING MATERIALS: None. This product is a fire extinguishing agent.
NUSUAL FIRE AND EXPLOSION HAZARDS: When involved in a fire, this material may ecompose and produce irritating fumes and toxic gases including sulfur oxides, carbon dioxide nd carbon monoxide.

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Not sensitive.

PECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural fire fighters must wear lf-Contained Breathing Apparatus and full protective equipment.

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6. ACCIDENTAL RELEASE MEASURES

ILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. pper protective equipment should be used. In case of a spill, clear the affected area, protect people, and respond with trained rsonnel. If it is determined that exposure guidelines for nuisance particulates – 10 mg/m^3 (total particulates) or 5 mg/m^3 (respirable ticulates) – is exceeded, use **Level C: triple-gloves (rubber gloves and nitrile gloves, over latex gloves), chemically resistant t and boots, hard-hat, and air purifying respirator with a HEPA filter.** Sweep-up the spilled solid and place all spill residue in a uble plastic bag and seal. Dispose of in accordance with Federal, State, and local hazardous waste disposal regulations (see ction 13).

ART III *How can I prevent hazardous situations from occurring?*

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7. HANDLING and STORAGE

RK PRACTICES AND HYGIENE PRACTICES: Avoid getting chemicals ON YOU or IN YOU. Wash hands after handling micals. Do not eat or drink while handling chemicals.
RAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Avoid thing dusts generated by this product.
TECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 idental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use this product in areas e adequate ventilation is provided. Decontaminate equipment using soapy water before maintenance begins. Collect all rinsates dispose of according to applicable Federal, State, or local procedures.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Use a mechanical fan or vent area to outside.

RESPIRATORY PROTECTION: Respiratory protection is not expected to be needed. Maintain airborne contaminant concentratio below guidelines for nuisance particulates: 10 mg/m^3 (total particulates) or 5 mg/m^3 (respirable particulates). If respiratory protection needed, use only protection authorized in 29 CFR 1910.134, or applicable State regulations. Use supplied air respiratory protection oxygen levels are below 19.5%.
EYE PROTECTION: Safety glasses.
HAND PROTECTION: Wear rubber gloves for routine industrial use. Use triple gloves for spill response, as stated in Section 6 of th MSDS.
BODY PROTECTION: Use body protection appropriate for task.

9. PHYSICAL and CHEMICAL PROPERTIES

VAPOR DENSITY: Not applicable.
SPECIFIC GRAVITY: Approximately 0.85
SOLUBILITY IN WATER: Not soluble. Water-repellent coating.
VAPOR PRESSURE, mm Hg @ 20 °C: Not applicable.

EVAPORATION RATE (n-BuAc=1): Not applicable.
MELTING POINT or RANGE: Not applicable.
BOILING POINT: Not applicable.
pH (10% solution): Approximately 4-5.

APPEARANCE AND COLOR: This material is a finely divided, yellowish powder.
HOW TO DETECT THIS SUBSTANCE (warning properties): This product does not have any specific warning properties.

10. STABILITY and REACTIVITY

STABILITY: Stable.
DECOMPOSITION PRODUCTS: Sulfur oxides, carbon monoxide and carbon dioxide.
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong alkalis, magnesium, swimming pool sanitizers (inorgan perchlorates, sodium dichloroisocyanurate dihydrate, trichloroisocyanuric acid, calcium hypochlorite, and other strong oxidizers).
HAZARDOUS POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: Incompatible materials.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following data is available for components of this product greater than 1 percent by weight in concentration.

AMMONIUM SULFATE

TDLo (oral, man) = 1500 mg/kg
LD_{50} (oral, rat) =3000 mg/kg
LD_{50} (interperitoneal, rat) =610 mg/kg

MONO-AMMONIUM PHOSPHATE

No toxicology information listed.

SUSPECTED CANCER AGENT: This product's ingredients are not found on the following lists: FEDERAL OSHA Z LIST, NT CAL/OSHA. A variety of silica forms (i.e. crystalline, fumed) are reported in IARC as a Group 3 Compound (Human Inadequa Evidence; Animal Inadequate Evidence).
IRRITANCY OF PRODUCT: This product may cause mild skin and respiratory irritation and moderate eye irritancy.
SENSITIZATION TO THE PRODUCT: This product is not known to cause sensitization.

11. TOXICOLOGICAL INFORMATION (Continued)

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on the human reproductive system.

Mutagenicity: This product is not known to cause mutagenic effects.
Teratogenicity: This product is not known to cause teratogenic effects.
Reproductive Toxicity: This product is not known to cause reproductive toxicity effects.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through enerational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate cross generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

EDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Prolonged contact with this product may cause pre-existing dermatitis to ecome aggravated. Persons sensitive to pulmonary irritation upon exposure to high concentrations of dust should use appropriate ngineering controls or respiratory protection when recharging fire extinguishers.

ECOMMENDATIONS TO PHYSICIANS: Treat patient symptoms. This product should not cause any notable clinical symptoms.

12. ECOLOGICAL INFORMATION

NVIRONMENTAL STABILITY: No adverse environmental consequences are expected.
FFECT OF MATERIAL ON PLANTS or ANIMALS: None currently known.
FFECT OF CHEMICAL ON AQUATIC LIFE: Not expected to harm aquatic life.

13. DISPOSAL CONSIDERATIONS

REPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local gulations. This chemical, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local azardous waste regulatory authority. Residue from fires extinguished with this material may be hazardous.
PA WASTE NUMBER: Not applicable.

14. TRANSPORTATION INFORMATION

HIS MATERIAL IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

ROPER SHIPPING NAME:	Not applicable.
AZARD CLASS NUMBER and DESCRIPTION:	Not applicable.
IDENTIFICATION NUMBER:	Not applicable.
CKING GROUP:	Not applicable.
T LABEL(S) REQUIRED:	Not applicable.
ERGENCY RESPONSE GUIDE NUMBER:	Not applicable.

RINE POLLUTANT: Not applicable.

IS MATERIAL IS NOT HAZARDOUS AS DEFINED BY TRANSPORT CANADA "TRANSPORTATION OF DANGEROUS ODS" REGULATIONS.

15. REGULATORY INFORMATION

SARA REPORTING REQUIREMENTS: No component of this product is subject to the reporting requirements of Sections 302, 30 and 313 of Title III of the Superfund Amendments and Reauthorization Act.

SARA Threshold Planning Quantity: Not applicable.

TSCA INVENTORY STATUS: All components are listed on the TSCA Inventory.

CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

OTHER FEDERAL REGULATIONS: Not applicable.

STATE REGULATORY INFORMATION: Chemicals in this product are covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances:. None.
California - Permissible Exposure Limits for Chemical Contaminants:. None.
Florida - Substance List: Mica Dust, Ammonium Sulfate (Dry, Crystalline).
Illinois - Toxic Substance List: None.
Kansas - Section 302/313 List: None.
Massachusetts - Substance List: Mica Dust., Ammonium Sulfate (Dry, Crystalline),
Minnesota - List of Hazardous Substances: None.
Missouri - Employer Information/Toxic Substance List: None.
New Jersey - Right to Know Hazardous Substance List: None.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: None.
Pennsylvania - Hazardous Substance List: None..
Rhode Island - Hazardous Substance List: Mica Dust, Ammonium Sulfate (Dry, Crystalline).
Texas - Hazardous Substance List: No..
West Virginia - Hazardous Substance List: None..
Wisconsin - Toxic and Hazardous Substances: None..

CALIFORNIA PROPOSITION 65: No component is listed on the California Proposition 65 lists.

LABELING (Precautionary Statements): CAUTION! May cause skin or eye irritation. Avoid contact with skin or eyes. In the event c contact, rinse affected part of your body with water for at least 15 minutes. Seek medical attention if reddening or irritation occur Keep container tightly closed. Store in a cool, dry location away from incompatible materials. Clean-up spills promptly. This produc will not contribute to the intensity of a fire.

TARGET ORGANS: Skin, eyes.

WHMIS SYMBOLS: Not applicable.

16. OTHER INFORMATION

PREPARED BY:

CHEMICAL SAFETY ASSOCIATES, Inc.
9163 Chesapeake Drive, San Diego, CA 92123-1002
619/565-0302

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to obtained from the use thereof. AMEREX Corporation assumes no responsibility for injury to the vendee or third persons proximately caused by the material if reasonable saf procedures are not adhered to as stipulated in the data sheet. Additionally, AMEREX Corporation assumes no responsibility for injury to vendee or third persons proximately caus by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear of a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:

ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits.

TLV - **Threshold Limit Value** - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour **Time Weighted Average** (TWA), the 15-minute **Short Term Exposure Limit**, and the instantaneous **Ceiling** Level. Skin adsorption effects must also be considered.

OSHA - U.S. Occupational Safety and Health Administration.

PEL - **Permissible Exposure Limit** - this exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The IDLH - **Immediately Dangerous to Life and Health** level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. The DFG - MAK is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL.

NIOSH is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (OSHA). NIOSH issues exposure guidelines called Recommended Exposure Levels (RELs). When no exposure guidelines are established, an entry of NE is made for reference.

FLAMMABILITY LIMITS IN AIR: Much of the information related to fire and explosion is derived from the National Fire Protection Association (NFPA).

LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION

Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: LD_{50} - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; LC_{50} - Lethal Concentration (gases) which kills 50% of the exposed animals; ppm concentration expressed in parts of material per million parts of air or water; mg/m^3 concentration expressed in weight of substance per volume of air; mg/kg quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: IARC - the International Agency for Research on Cancer; NTP - the National Toxicology Program, RTECS - the Registry of Toxic Effects of Chemical Substances, OSHA and CAL/OSHA. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include TDLo, the lowest dose to cause a symptom; TDo, LDLo, and LDo, the lowest dose to cause death.

REGULATORY INFORMATION

This section explains the impact of various laws and regulations on the material. EPA is the U.S. Environmental Protection Agency. WHMIS is the Canadian Workplace Hazard information System. DOT and CTC are the U.S. Department of Transportation and the Canadian Transportation Commission, respectively. These are: Superfund Amendments and Reauthorization Act (SARA); the Toxic Substance Control Act (TSCA); Marine Pollutant status according to the DOT; California's Safe Drinking Water Act (Proposition 65); the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund); and various state regulations. This section also includes information on the precautionary warnings which appear on the materials package label.

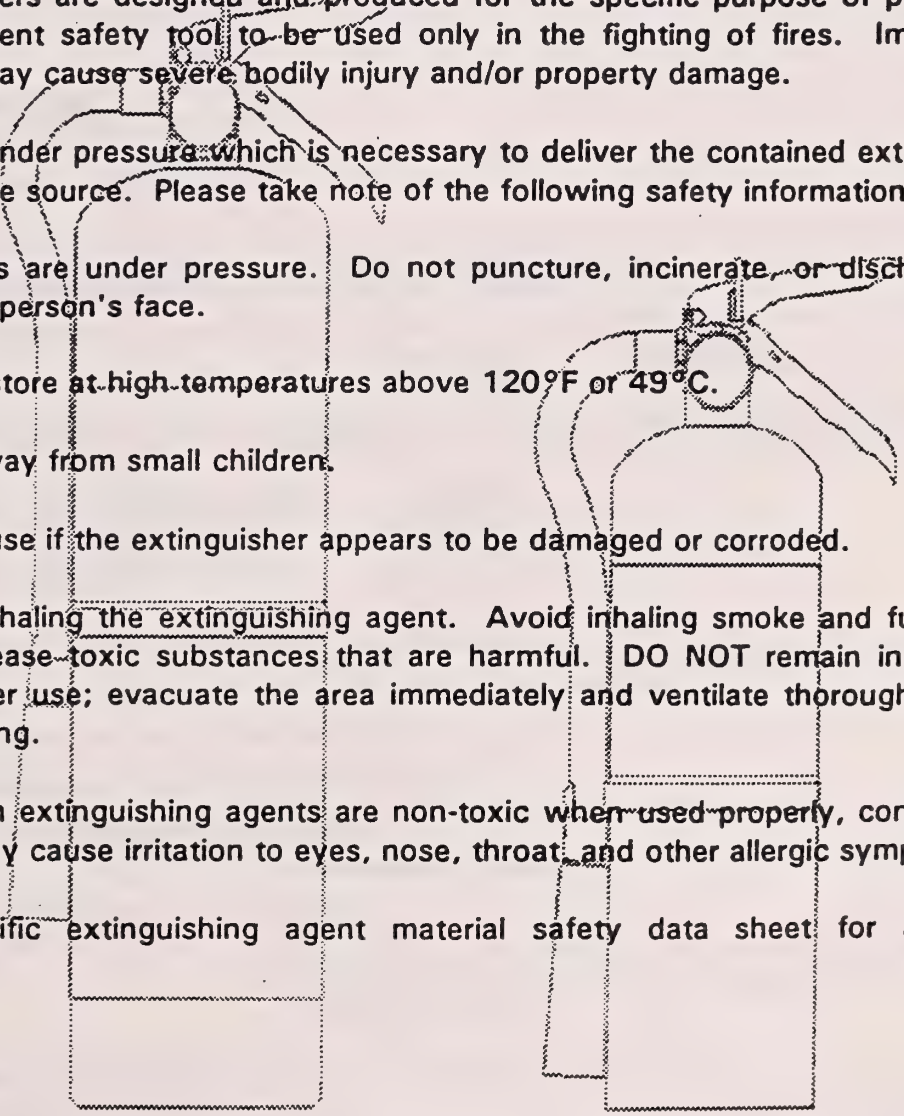
FIRE EXTINGUISHER
Cautions and Warnings

Fire extinguishers are designed and produced for the specific purpose of providing a safe and efficient safety tool to be used only in the fighting of fires. Improper or careless use may cause severe bodily injury and/or property damage.

Contents are under pressure which is necessary to deliver the contained extinguishing agent to the fire source. Please take note of the following safety information:

- Contents are under pressure. Do not puncture, incinerate, or discharge into another person's face.
- Do not store at high temperatures above 120°F or 49°C.
- Keep away from small children.
- Do not use if the extinguisher appears to be damaged or corroded.
- Avoid inhaling the extinguishing agent. Avoid inhaling smoke and fumes - all fires release toxic substances that are harmful. DO NOT remain in a closed area after use; evacuate the area immediately and ventilate thoroughly before re-entering.
- Although extinguishing agents are non-toxic when used properly, contact with them may cause irritation to eyes, nose, throat, and other allergic symptoms.

Refer to specific extinguishing agent material safety data sheet for additional information.



AVOID INHALING SMOKE AND FUMES; ALL FIRES RELEASE TOXIC SUBSTANCES THAT ARE HARMFUL. DO NOT REMAIN IN CLOSED AREA AFTER USE. VENTILATE CLOSED AREAS BEFORE RETURNING.

EXXON COMPANY, U.S.A.
A DIVISION OF EXXON CORPORATION

DATE ISSUED: 12/02/91
SUPERSEDES DATE: 08/01/91

MATERIAL SAFETY DATA SHEET

EXXON COMPANY, U.S.A. P.O. BOX 2180 HOUSTON, TX 77252-2180

A. IDENTIFICATION AND EMERGENCY INFORMATION

PRODUCT NAME
EXXON REGULAR (UNLEADED)

PRODUCT CODE
026000 - 00308

PRODUCT CATEGORY
Motor Gasoline

PRODUCT APPEARANCE AND ODOR
Clear colored liquid (typically yellow)
Gasoline hydrocarbon odor

MEDICAL EMERGENCY TELEPHONE NUMBER
(713) 656-3424

B. COMPONENTS AND HAZARD INFORMATION

COMPONENTS	**CAS NO. OF COMPONENTS**	**APPROXIMATE CONCENTRATION**
Product is a variable complex mixture of components, principally hydrocarbons, blended to performance, rather than chemical, specifications and typically contains the following:		
Naphtha (petroleum), light catalytic cracked	64741-55-5	
Naphtha (petroleum), heavy catalytic cracked	64741-54-4	
Naphtha (petroleum), full-range reformed	68919-37-9	
Naphtha (petroleum), full-range alkylate	64741-64-6	
Naphtha (petroleum), sweetened	64741-87-3	
Butane	106-97-8	
Proprietary Additives	Proprietary	

All components of this product are listed on the U.S. TSCA inventory.

See Section E for Health and Hazard Information.

See Section H for additional Environmental information.

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM (HMIS)

Health	Flammability	Reactivity	BASIS
1	4	0	Recommended by Exxon

EXPOSURE LIMIT FOR TOTAL PRODUCT	**BASIS**
100 ppm (300 mg/m3) for an 8-hour workday	Recommended by Exxon. OSHA Regulation 29 CFR 1910.1000 and the American Conference of Governmental Industrial Hygienists (ACGIH) list Threshold Limit Values (TLV) of 300 ppm (900 mg/m3) for an 8-hour workday; 500 ppm (1500 mg/m3) STEL.
The airborne benzene level shall not exceed 1 ppm for an 8-hour workday; 5 ppm STEL.	OSHA Regulation 29 CFR 1910.1028

C. PRIMARY ROUTES OF ENTRY AND EMERGENCY AND FIRST AID PROCEDURES

EYE CONTACT
If splashed into the eyes, flush with clear water for 15 minutes or until irritation subsides. If irritation persists, call a physician.

SKIN
In case of skin contact, remove any contaminated clothing and wash skin with soap and water. Launder or dry-clean clothing before reuse. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though intial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

INHALATION
If overcome by vapor, remove from exposure and call a physician immediately. If breathing is irregular or has stopped, start resuscitation, administer oxygen, if available.

INGESTION
If ingested, DO NOT induce vomiting; call a physician immediately.

D. FIRE AND EXPLOSION HAZARD INFORMATION

UNUSUAL FIRE AND EXPLOSION HAZARD

EXTREMELY FLAMMABLE   VAPORS CAN TRAVEL AND EXPLODE

FLASH POINT (MINIMUM)
EXTREMELY FLAMMABLE - Per DOT 49 CFR 173.115
Approximately -38°C (-36°F)

AUTOIGNITION TEMPERATURE
Approximately 456°C (853°F)
National Fire Protection Association's
Guide on Hazardous Materials

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) - HAZARD IDENTIFICATION

Health	Flammability	Reactivity	BASIS
1	3	0	Recommended by the National Fire Protection Association

HANDLING PRECAUTIONS
This liquid is volatile and gives off invisible vapors. Either the liquid or vapor may settle in low areas or travel some distance along the ground or surface to ignition sources where they may ignite or explode.

Keep product away from ignition sources, such as heat, sparks, pilot lights, static electricity, and open flames.

FLAMMABLE OR EXPLOSIVE LIMITS (APPROXIMATE PERCENT BY VOLUME IN AIR)
Estimated values: Lower Flammable Limit 1.4%   Upper Flammable Limit 7.6%

EXTINGUISHING MEDIA AND FIRE FIGHTING PROCEDURES
Foam, water spray (fog), dry chemical, carbon dioxide and vaporizing liquid type extinguishing agents may all be suitable for extinguishing fires involving this type of product, depending on size or potential size of fire and circumstances related to the situation. Plan fire protection and response strategy through consultation with local fire protection authorities or appropriate specialists.

The following procedures for this type of product are based on the recommendations in the National Fire Protection Association's "Fire Protection Guide on Hazardous Materials", Eighth Edition (1984):

Use dry chemical, foam or carbon dioxide to extinguish the fire. Water may be ineffective, but water should be used to keep fire-exposed containers cool. If a leak or spill has ignited, use water spray to disperse the vapors and to protect men attempting to stop a leak. Water spray may be used to flush spills away from exposures. Minimize breathing of gases, vapor, fumes or decomposition products. Use supplied-air breathing equipment for enclosed or confined spaces or

as otherwise needed.

NOTE: The inclusion of the phrase "water may be ineffective" is to indicate that although water can be used to cool and protect exposed material, water may not extinguish the fire unless used under favorable conditions by experienced fire fighters trained in fighting all types of flammable liquid fires.

DECOMPOSITION PRODUCTS UNDER FIRE CONDITIONS
Fumes, smoke, carbon monoxide, aldehydes and other decomposition products, in the case of incomplete combustion.

"EMPTY" CONTAINER WARNING
"Empty" containers retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to clean since residue is difficult to remove. "Empty" drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All other containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. For work on tanks refer to Occupational Safety and Health Administration regulations, ANSI Z49.1, and other governmental and industrial references pertaining to cleaning, repairing, welding, or other contemplated operations.

E HEALTH AND HAZARD INFORMATION

VARIABILITY AMONG INDIVIDUALS
Health studies have shown that many petroleum hydrocarbons and synthetic lubricants pose potential human health risks which may vary from person to person. As a precaution, exposure to liquids, vapors, mists or fumes should be minimized.

EFFECTS OF OVEREXPOSURE (Signs and symptoms of exposure)
High vapor concentrations (greater than approximately 1000 ppm) are irritating to the eyes and the respiratory tract, and may cause headaches, dizziness, anesthesia, drowsiness, unconsciousness, and other central nervous system effects, including death.

Prolonged or repeated liquid contact with the skin will dry and defat the skin, leading to possible irritation and dermatitis.

NATURE OF HAZARD AND TOXICITY INFORMATION
Prolonged or repeated skin contact with this product tends to remove skin oils, possibly leading to irritation and dermatitis; however, based on human experience and available toxicological data, this product is judged to be neither a "corrosive" nor an "irritant" by OSHA criteria.

Product contacting the eyes may cause eye irritation.

This product may contain up to a maximum of 4.9 weight percent benzene, CAS No. 71-43-2, as a natural constituent of various gasoline blend components. Benzene can cause anemia and other blood diseases, including leukemia (cancer of the blood-forming system), after prolonged or repeated exposures at high concentrations (e.g., 50-500 ppm). It has also caused fetal defects in tests on laboratory animals.

Contains light hydrocarbon components. Lifetime studies by the American Petroleum Institute have shown that kidney damage and kidney cancer can occur in male rats after prolonged inhalation exposures at elevated concentrations of total gasoline. Kidneys of mice and female rats were unaffected. The implication of these data for humans has not been determined..particularly since most human exposures are to light components, not to total gasoline. Certain components, such as normal hexane, may also affect the nervous system at high concentrations (e.g., 1000-1500 ppm). Typically, n-hexane represents 1 to 3% of gasoline. May contain a combined concentration of toluene, CAS No. 108-88-3, and xylene, CAS No. 1330-20-7, ranging from approximately 5 to 50%.

Product has a low order of acute oral and dermal toxicity, but minute amounts aspirated into the lungs during ingestion or vomiting may cause mild to severe pulmonary injury and possibly death.

This product is judged to have an acute oral LD50 (rat) greater than 5 g/kg of body weight, and an acute dermal LD50 (rabbit) greater than 3.16 g/kg of body weight.

Inhalation of components of exhaust from burning, such as carbon monoxide, may cause death at high concentrations. Exposure to the exhaust of this fuel should be minimized.

PRE-EXISTING MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED BY EXPOSURE

Benzene - Individuals with liver disease may be more susceptible to toxic effects.

Hexane - Individuals with neurological disease should avoid exposure.

Petroleum Solvents/Petroleum Hydrocarbons - Skin contact may aggravate an existing dermatitis.

F. PHYSICAL DATA

The following data are approximate or typical values and should not be used for precise design purposes.

BOILING RANGE
Approximately 21°C (70°F) IBP
to 227°C (440°F) FBP

SPECIFIC GRAVITY (15.6 C/15.6 C)
Approximately 0.74

MOLECULAR WEIGHT
Complex mixture, components vary
from approximately 45 to 185

pH
Essentially neutral

POUR, CONGEALING OR MELTING POINT
Less than -38°C (-36 F)
Pour Point by ASTM D 97

VISCOSITY
Approximately 0.5 cSt @ 25°C

VAPOR PRESSURE
Varies seasonally from approximately
5 to 15 psi Reid Vapor Pressure

VAPOR DENSITY (AIR = 1)
Approximately 5

PERCENT VOLATILE BY VOLUME
100

EVAPORATION RATE @ 1 ATM. AND 25 C (77 F)
(n-BUTYL ACETATE = 1)
Approximately 10-11

SOLUBILITY IN WATER @ 1 ATM. AND 25 C (77 F)
Negligible; less than 0.1%

G. REACTIVITY

This product is stable and will not react violently with water. Hazardous polymerization will not occur. Avoid contact with strong oxidants such as liquid chlorine, concentrated oxygen, sodium hypochlorite, calcium hypochlorite, etc.

H. ENVIRONMENTAL INFORMATION

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Shut off and eliminate all ignition sources. Keep people away. Recover free product. Add sand, earth or other suitable absorbent to spill area. Minimize breathing vapors. Minimize skin contact. Ventilate confined spaces. Open all windows and doors. Keep product out of sewers and watercourses by diking or impounding. Advise authorities if product has entered or may enter sewers, watercourses, or extensive land areas.
Assure conformity with applicable governmental regulations. Continue to observe precautions for volatile, flammable vapors from absorbed material.

THE FOLLOWING INFORMATION MAY BE USEFUL IN COMPLYING WITH VARIOUS STATE AND FEDERAL LAWS AND REGULATIONS UNDER VARIOUS ENVIRONMENTAL STATUTES:

REPORTABLE QUANTITY (RQ), EPA REGULATION 40 CFR 302 (CERCLA Section 102)

The RQ for:

Benzene is 10 pounds (4.54 kg). This product may contain approximately 4.9% benzene.
Cumene is 5,000 pounds. This product may contain approximately 0.3% cumene.
Cyclohexane is 1,000 pounds. This product may contain approximately 0.5% cyclohexane.
Ethylbenzene is 1,000 pounds. This product may contain approximately 2.5% ethylbenzene.
Naphthalene is 100 pounds. This product may contain approximately 0.7% naphthalene.
Toluene is 1,000 pounds. This product may contain approximately 16% toluene.
Xylene is 1,000 pounds. This product may contain approximately 10% xylene.

THRESHOLD PLANNING QUANTITY (TPQ), EPA REGULATION 40 CFR 355 (SARA Sections 301-304)
No TPQ for product or any constituent greater than 1% or 0.1% (carcinogen).

TOXIC CHEMICAL RELEASE REPORTING, EPA REGULATION 40 CFR 372 (SARA Section 313)
This product may contain:
- Approximately 4.5% benzene.
- Approximately 0.3% cumene.
- Approximately 0.5% cyclohexane.
- Approximately 2.5% ethylbenzene.
- Approximately 6.0% methyl-t-butyl ether.
- Approximately 0.7% naphthalene.
- Approximately 16% toluene.
- Approximately 10% xylene.

HAZARDOUS CHEMICAL REPORTING, EPA REGULATION 40 CFR 370 (SARA Sections 311-312)

	Acute Hazard	Chronic Hazard	Fire Hazard	Pressure Hazard	Reactive Hazard	Not Applicable
EPA HAZARD CLASSIFICATION CODE:	XXX	XXX	XXX			

I. PROTECTION AND PRECAUTIONS

VENTILATION
Use only with ventilation sufficient to prevent exceeding recommended exposure limit or buildup of explosive concentrations of vapor in air. No smoking, flame or other ignition sources.

RESPIRATORY PROTECTION
Use supplied-air respiratory protection in confined or enclosed spaces, if needed.

PROTECTIVE GLOVES
Use chemical-resistant gloves, if needed, to avoid prolonged or repeated skin contact.

EYE PROTECTION
Use splash goggles or face shield when eye contact may occur.

OTHER PROTECTIVE EQUIPMENT
Use chemical-resistant apron or other impervious clothing, if needed, to avoid contaminating regular clothing, which could result in prolonged or repeated skin contact.

WORK PRACTICES / ENGINEERING CONTROLS
Keep containers closed when not in use. Do not store near heat, sparks, flame or strong oxidants. Adequate ventilation required sufficient to prevent exceeding recommended exposure limit or buildup of explosive concentrations of vapor in air. Tanks that have been in leaded gasoline service may have lead-containing residue. Special precautions needed in cleaning. See American Petroleum Institute publications 2013, 2015 and 2015A. No smoking, flame or other ignition sources.

To minimize fire or explosion risk from static charge accumulation and discharge, effectively ground product transfer system in accordance with the National Fire Protection Association standard for petroleum products.

For use as a motor fuel only. Do not use as a cleaning solvent, or thinner, or for other non-motor fuel uses. Do not siphon by mouth. Minute amounts of liquid gasoline aspirated into the lungs may cause potentially fatal chemical pneumonitis.

In order to prevent fire or explosion hazards, use appropriate equipment.

Information on electrical equipment appropriate for use with this product may be found in the latest edition of the National Electrical Code (NFPA-70). This document is available from the National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.

PERSONAL HYGIENE
Minimize breathing vapor or mist. Avoid prolonged or repeated contact with skin. Remove contaminated clothing; launder or dry-clean before re-use. Remove contaminated shoes and thoroughly clean and dry before re-use. Cleanse skin thoroughly after contact, before breaks and meals, and at end of work period. Product is readily removed from skin by waterless hand cleaners followed by washing thoroughly with soap and water.

J. TRANSPORTATION AND OSHA RELATED LABEL INFORMATION

TRANSPORTATION INCIDENT INFORMATION

For further information relative to spills resulting from transportation incidents, refer to latest Department of Transportation Emergency Response Guidebook for Hazardous Materials Incidents, DOT P 5800.3.

DOT IDENTIFICATION NUMBER

Gasoline / Flammable Liquid / UN 1203

OSHA REQUIRED LABEL INFORMATION

In compliance with hazard and right-to-know requirements, the following OSHA Hazard Warnings should be found on a label, bill of lading or invoice accompanying this shipment.

DANGER!

EXTREMELY FLAMMABLE

LONG-TERM, REPEATED EXPOSURE MAY CAUSE
CANCER, BLOOD, KIDNEY AND
NERVOUS SYSTEM DAMAGE

CONTAINS: BENZENE

Note: Product label will contain additional non-OSHA related information.

The information and recommendations contained herein are, to the best of Exxon's knowledge and belief, accurate and reliable as of the date issued. Exxon does not warrant or guarantee their accuracy or reliability, and Exxon shall not be liable for any loss or damage arising out of the use thereof.

The information and recommendations are offered for the user's consideration and examination, and it is the user's responsibility to satisfy itself that they are suitable and complete for its particular use. If buyer repackages this product, legal counsel should be consulted to insure proper health, safety and other necessary information is included on the container.

The Environmental Information included under Section H hereof as well as the Hazardous Materials Identification System (HMIS) and National Fire Protection Association (NFPA) ratings have been included by Exxon Company, U.S.A. in order to provide additional health and hazard classification information. The ratings recommended are based upon the criteria supplied by the developers of these rating systems, together with Exxon's interpretation of the available data.

FOR ADDITIONAL INFORMATION ON HEALTH EFFECTS CONTACT:

DIRECTOR OF INDUSTRIAL HYGIENE
EXXON COMPANY, U.S.A.
KELLOGG TOWER, ROOM 560
P. O. BOX 2180
HOUSTON, TX 77252-2180
(713) 656-2443

FOR OTHER PRODUCT INFORMATION CONTACT:

MANAGER, MARKETING TECHNICAL SERVICES
EXXON COMPANY, U.S.A.
ROOM 2355
P. O. BOX 2180
HOUSTON, TX 77252-2180
(713) 656-5949

J.T.Baker®
222 Red School Lane
Phillipsburg, NJ 08865
24-Hour Emergency Telephone 908-859-2151
National Response Center 800-424-8802
Chemtrec 800-424-9300

CANUTEC 613-996-6666
Outside U.S. and Canada
Chemtrec 202-483-7616

FICHE SIGNALÉTIQUE HOJAS DE DATOS DE SEGURIDAD

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers are to be used on the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemi
All non-emergency questions should be directed to Customer Service (1-800-JTBAKER) for assistance

880 -03 Hydrochloric Acid Page: 1
ffective: 05/01/89 Issued: 08/09/91

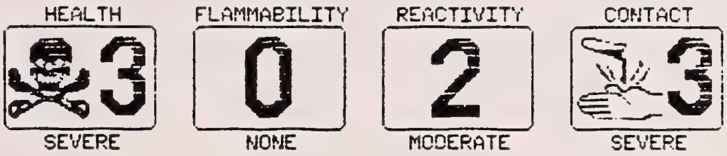
T.BAKER INC., 222 Red School Lane, Phillipsburg, NJ 08865

SECTION I - PRODUCT IDENTIFICATION

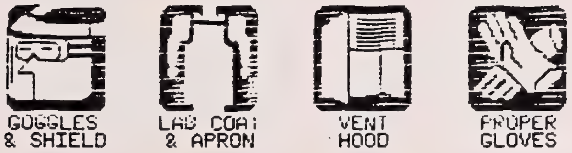
roduct Name: Hydrochloric Acid
ommon Synonyms: Muriatic Acid; Chlorohydric Acid; Hydrogen Chloride, Aqueous
hemical Family: Inorganic Acids
ormula: HCl
ormula Wt.: 36.46
AS No.: 7647-01-0
IOSH/RTECS No.: MW4025000
roduct Use: Laboratory Reagent
oduct Codes: 9538,9537,9535,4800,9542,9534,5537,9549,9529,9547,9546,6900
9536,9540,9539,9548,5367,9544,5800,5214,5575,9543,9530

PRECAUTIONARY LABELING

ER SAF-T-DATA* System



boratory Protective Equipment



U.S. Precautionary Labeling

POISON! DANGER!
USES SEVERE BURNS. MAY BE FATAL IF SWALLOWED OR INHALED.
not get in eyes, on skin, on clothing. Do not breathe vapor. Causes damage
Respiratory system (lungs), eyes and skin. Keep in tightly closed
ntainer. Loosen closure cautiously. Use with adequate ventilation. Wash
oroughly after handling. In case of spill neutralize with soda ash or lime
place in dry container.

Continued on Page: 2

PRECAUTIONARY LABELING (CONTINUED)

International Labeling

ritating to eyes and skin.
ep out of reach of children. In case of contact with eyes, rinse immediately th plenty of water and seek medical advice.

F-T-DATA* Storage Color Code: White (corrosive)

SECTION II - COMPONENTS

mponent	CAS No.	Weight %	OSHA/PEL	ACGIH/TLV
drochloric Acid	7647-01-0	33-40	5 ppm	5 ppm
er	7732-18-5	60-67	N/E	N/E

SECTION III - PHYSICAL DATA

iling Point: 149°C (300°F) (at 760 mm Hg)

Vapor Pressure (mmHg): N/A

lting Point: -25°C (-13°F) (at 760 mm Hg)

Vapor Density (air=1): 1.3

ecific Gravity: 1.18 (H_2O=1)

Evaporation Rate: N/A

ubility(H_2O): Complete (100%)

% Volatiles by Volume: 100 (21°C)

1.0 (0.1M solution)

r Threshold (ppm): N/A

Physical State: Liquid

fficient Water/Oil Distribution: N/A

earance & Odor: Clear, colorless fuming liquid. Pungent odor.

Continued on Page: 3

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

lash Point (Closed Cup): N/A NFPA 704M Rating: 3-0-0

utoignition Temperature: N/A

lammable Limits: Upper - N/A Lower - N/A

ire Extinguishing Media
Use extinguishing media appropriate for surrounding fire.

pecial Fire-Fighting Procedures
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool. Do not get water inside containers.

sual Fire & Explosion Hazards
May emit hydrogen gas upon contact with metal.

xic Gases Produced
hydrogen chloride, hydrogen

plosion Data-Sensitivity to Mechanical Impact
None identified.

plosion Data-Sensitivity to Static Discharge
None identified.

SECTION V - HEALTH HAZARD DATA

reshold Limit Value (TLV/TWA): 7 mg/m³ (5 ppm)

V (Ceiling) is for Hydrogen chloride.

ort-Term Exposure Limit (STEL): Not Established

rmissible Exposure Limit (PEL): 7 mg/m³ (5 ppm)

(Ceiling) is for Hydrogen chloride.

xicity of components

Continued on Page: 4

SECTION V - HEALTH HAZARD DATA (CONTINUED)

traperitoneal Mouse LD_{50} for Hydrochloric Acid	40	mg/kg
al Rabbit LD_{50} for Hydrochloric Acid	900	mg/kg
halation-1Hr Rat LC_{50} for Hydrochloric Acid	3124	ppm
traperitoneal Mouse LD_{50} for Water	190	g/kg
travenous Mouse LD_{50} for Water	25	g/kg

rcinogenicity: NTP: No IARC: No Z List: No OSHA Reg: No

rcinogenicity
None identified.

productive Effects
None identified.

fects of Overexposure

INHALATION:	pulmonary edema, circulatory failure, respiratory system damage, collapse, coughing, difficult breathing
SKIN CONTACT:	severe burns
EYE CONTACT:	severe burns
SKIN ABSORPTION:	none identified
INGESTION:	is harmful and may be fatal, severe burns to mouth, throat, and stomach, nausea, vomiting
CHRONIC EFFECTS:	may cause teeth damage

get Organs
respiratory system, eyes, skin

ical Conditions Generally Aggravated by Exposure
none identified

mary Routes of Entry
ingestion, inhalation, skin contact, eye contact

Continued on Page: 5

SECTION V - HEALTH HAZARD DATA (CONTINUED)

mergency and First Aid Procedures

INGESTION: CALL A PHYSICIAN. If swallowed, do NOT induce vomiting. If conscious, give water, milk, or milk of magnesia.

INHALATION: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

SKIN CONTACT: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

EYE CONTACT: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

SARA/TITLE III HAZARD CATEGORIES and LISTS

ute: Yes Chronic: Yes Flammability: No Pressure: No Reactivity: No

tremely Hazardous Substance:	Yes	Contains Hydrogen Chloride (RQ = 1 LB, TPQ = 500 LBS)
RCLA Hazardous Substance:	Yes	Contains Hydrochloric Acid (RQ = 5000 LBS)
RA 313 Toxic Chemicals:	Yes	Contains Hydrochloric Acid
Generic Class:		C16
CA Inventory:	Yes	

SECTION VI - REACTIVITY DATA

ability: Stable Hazardous Polymerization: Will not occur

nditions to Avoid: heat, moisture

compatibles: most common metals, water, amines, metal oxides, acetic anhydride, propiolactone, vinyl acetate, mercuric sulfate, calcium phosphide, formaldehyde, alkalies, carbonates, strong bases, sulfuric acid, chlorosulfonic acid

mposition Products: hydrogen chloride, hydrogen, chlorine

Continued on Page: 6

SECTION VII - SPILL & DISPOSAL PROCEDURES

teps to be Taken in the Event of a Spill or Discharge

Wear self-contained breathing apparatus and full protective clothing. Stop leak if you can do so without risk. Ventilate area. Neutralize spill with soda ash or lime. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

. T. Baker NEUTRASORB^{R} or TEAM^{R} 'Low Na+' acid neutralizers are recommended or spills of this product.

isposal Procedure

Dispose in accordance with all applicable federal, state, and local environmental regulations.

PA Hazardous Waste Number: D002 (Corrosive Waste)

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

entilation:	Use general or local exhaust ventilation to meet TLV requirements.
espiratory Protection:	Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 100 ppm, a chemical cartridge respirator with acid cartridge is recommended. Above this level, a self-contained breathing apparatus is advised.
ye/Skin Protection:	Safety goggles and face shield, uniform, protective suit, neoprene gloves are recommended.

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

AF-T-DATA* Storage Color Code: White (corrosive)

orage Requirements

Keep container tightly closed. Store in corrosion-proof area. Isolate from incompatible materials. Do not store near oxidizing materials.

Continued on Page: 7

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

mestic (D.O.T.)

pper Shipping Name: Hydrochloric acid
zard Class: Corrosive material (liquid)
NA: UN1789 Reportable Quantity: 5000 LBS.
bels: CORROSIVE
gulatory References: 49CFR 172.101; 173.263

ternational (I.M.O.)

pper Shipping Name: Hydrochloric acid, solution
zard Class: 8 I.M.O. Page: 8183
UN1789 Marine Pollutants: No Packaging Group: II
bels: CORROSIVE
gulatory References: 49CFR 172.102; Part 176; IMO

(I.C.A.O.)

per Shipping Name: Hydrochloric acid, solution
ard Class: 8
UN1789 Packaging Group: II
els: CORROSIVE
ulatory References: 49CFR 172.101; 173.6; Part 175; ICAO/IATA

. Customs Harmonization Number: 28061000000

= Not Applicable or Not Available
= Not Established

information in this Material Safety Data Sheet meets the
uirements of the United States OCCUPATIONAL SAFETY AND HEALTH ACT and
ulations promulgated thereunder (29 CFR 1910.1200 et. seq.) and the
adian WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM. This document
intended only as a guide to the appropriate precautionary handling of
material by a person trained in, or supervised by a person trained
chemical handling. The user is responsible for determining the
cautions and dangers of this chemical for his or her particular
lication. Depending on usage, protective clothing including eye and
guards and respirators must be used to avoid contact with material
reathing chemical vapors/fumes.
osure to this product may have serious adverse health effects. This
mical may interact with other substances. Since the potential uses
so varied, Baker cannot warn of all of the potential dangers of use
interaction with other chemicals or materials. Baker warrants that

Continued on Page: 8

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he chemical meets the specifications set forth on the label.
BAKER DISCLAIMS ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED WITH REGARD
TO THE PRODUCT SUPPLIED HEREUNDER, ITS MERCHANTABILITY OR ITS FITNESS
FOR A PARTICULAR PURPOSE.
The user should recognize that this product can cause severe injury and
even death, especially if improperly handled or the known dangers of use
are not heeded. READ ALL PRECAUTIONARY INFORMATION. As new documented
general safety information becomes available, Baker will periodically
revise this Material Safety Data Sheet.
Note: CHEMTREC, CANUTEC, and NATIONAL RESPONSE CENTER emergency telephone
numbers are to be used ONLY in the event of CHEMICAL EMERGENCIES involving
a spill, leak, fire, exposure, or accident involving chemicals. All
non-emergency questions should be directed to Customer Service
(1-800-JTBAKER) for assistance.

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TRADEMARKS OF J.T.BAKER INC.

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roved by Quality Assurance Department.

-- LAST PAGE --

0011

Burdick & Jackson
1953 South Harvey Street
Muskegon, MI 49442 USA

MATERIAL SAFETY DATA SHEET

Methanol

Revision Date: December, 1993
Revision No: 1

Information/Emergency Telephone Number	616.726.3171
Chemtrec Telephone Number	800.424.9300
Canadian Emergency Telephone Number	613.996.6666

I. Identification

Chemical Name:	Methanol	**Molecular Weight:**	32.04
Chemical Family:	Alcohol	**Formula:**	CH_4O
Synonyms:	Carbinol, Methyl Alcohol, Wood Alcohol		
DOT Proper Shipping Name:	Methanol		
DOT Hazard Class:	Flammable Liquid and Poison, Hazard Class 3, P.G. II		
DOT Identification Number:	UN1230	**CAS Number:**	67-56-1

II. Physical and Chemical Data

Boiling Point, 760 mm Hg:	64.7° C	**Freezing Point:**	-97.7° C	**Evaporation Rate:**	(BuAc=1) ca 5
Vapor Pressure at 20° C:	97 mm Hg	**Vapor Density (air=1):**	1.11	**Solubility in Water:**	@ 20° C complete
% Volatiles by Volume:	ca 100	**Specific Gravity (H_2O=1):**	@ 20° C 0.792	**Stability:**	Stable

Hazardous Polymerization:	Not expected to occur.
Appearance and Odor:	A clear, colorless liquid with a slight alcoholic odor.
Conditions to Avoid:	Heat, sparks, open flame, open containers, and poor ventilation.
Materials to Avoid:	Strong oxidizing agents and reactive metals which will displace hydrogen.
Hazardous Decomposition Products:	Incomplete combustion can generate carbon monoxide and other toxic vapors such as formaldehyde.

III. Fire and Explosion Hazard Data

Flash Point (test method):	12° C (Tag closed cup)	Auto Ignition Temperature:	385° C
Flammable Limits in Air % by Volume: Lower Limit	6.0	Upper Limit:	36.5

Unusual Fire and Explosion Hazards:	May burn with an invisible flame. Mixtures with water as low as 21% by volume are still flammable (flash point below 37.8° C). Under some circumstances can corrode certain metals, including aluminum and zinc, and generate hydrogen gas.
Extinguishing Media:	Carbon dioxide, dry chemical, alcohol foam, water mist, or fog.
Special Fire Fighting Procedures:	Wear full protective clothing and self-contained breathing apparatus. Heat will build pressure an may rupture closed storage containers. Keep fire-exposed containers cool with water spray.

IV. Hazardous Components

Methanol	Wt. % ca 100	TLV	200 ppm (skin)	CAS No.	67-56-1

Burdick & Jackson's Disclaimer: The information and recommendations presented in this Material Safety Data Sheet are based on sources believed to be reliable on the date hereof. Burdick & Jackson makes no representation on its completeness or accuracy. It is the user's responsibility to determine the product's suitability for its intended use, the product's safe use, and the product's proper disposal. No representations or warranties, either express or implied, of merchantability or fitness for a particular purpose or of any other nature are made with respect to the information provided in this Material Safety Data Sheet or to the product to which such information refers. Burdick & Jackson neither assumes nor authorizes any other person to assume for it, any other or additional liability or responsibility resulting from the use of, or reliance upon, this information.

V. Health Hazards

Occupational Exposure Limits

OSHA	TWA	200 ppm (skin)
	STEL	250 ppm
	Ceiling	not listed
ACGIH	TLV-TWA	200 ppm (skin)
	TLV-STEL	250 ppm
NIOSH	10-hour TWA	200 ppm (skin)
	STEL	250 ppm

Concentration Immediately Dangerous to Health

OSHA/NIOSH	25,000 ppm

Odor Threshold

NSC	10 ppm
NIOSH	2,000 ppm

Carcinogenic Data

Methanol is not listed as a carcinogen by IARC, NTP, OSHA, or ACGIH.

Primary Routes of Entry

Methanol may exert its effects through inhalation, skin absorption, and ingestion.

Industrial Exposure: Route of Exposure/Signs and Symptoms

Inhalation: Exposure can cause drowsiness and intoxication, headache, visual disturbance leading to blindness, coughing and shortness of breath, collapse and death at high concentrations.

Eye Contact: Liquid and can cause moderate burning, watering, swelling, and redness; high vapor concentration (greater than 2,000 ppm) may cause same symptoms .

Skin Contact: This substance may be absorbed through intact skin and produce toxic effects. Extensive, repeated and/or prolonged skin contact can cause burning, itching, redness, or blisters.

Ingestion: Causes burning of the gastrointestinal tract and toxic effects. Swallowing more than 2 ounces of methanol can cause death.

Effects of Overexposure

Mild poisoning is characterized by fatigue, nausea, headache, and delayed visual blurring. Moderate intoxication results in severe depression. Temporary or permanent blindness may follow in 2-6 days In severe poisoning, symptoms progress to rapid, shallow respiration. cyanosis, coma, hypotension, dilated pupils, and visual disturbance. Death may result from respiratory failure.

Medical Condition Aggravated by Exposure

Preclude from exposure those individuals with diseases of eyes, liver, kidneys, and lungs.

Emergency First Aid

Inhalation: Immediately remove to fresh air. If not breathing, administer mouth-to-mouth rescue breathing. If there is no pulse, administer cardiopulmonary resuscitation (CPR). Contact physician immediately.

Eye Contact: Rinse with copious amounts of water for at least 15 minutes. Get emergency medical assistance.

Skin Contact: Flush thoroughly for at least 15 minutes. Wash affected skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before re-use, and discard contaminated shoes. Get emergency medical assistance.

Ingestion: Call local Poison Control Center for assistance. Contact physician immediately. Never induce vomiting or give anything by mouth to a victim unconscious or having convulsions.

Note to Physician

In case of ingestion or massive inhalation, observe victim as an inpatient because slow metabolism causes a latent period of 24 hours between exposure and acidosis and blindness.

VI. Safety Measures and Equipment

Ventilation:	Adequate ventilation is required to protect personnel from exposure to chemical vapors exceeding the PEL and to minimize fire hazards. The choice of ventilation equipment, either local or general, will depend on the conditions of use, quantity of material, and other operating parameters.
Respiratory:	Use approved respirator equipment. Follow NIOSH and equipment manufacturer's recommendations to determine appropriate equipment (air-purifying, air-supplied, or self-contained breathing apparatus).
Eyes:	Safety glasses are considered minimum protection. Goggles or face shield may be necessary depending on quantity of material and conditions of use.
Skin:	Protective gloves and clothing are recommended. The choice of material must be based on chemical resistance and other user requirements. Generally, neoprene, nitrile rubber, or rubber offers acceptable chemical resistance. Individuals who are acutely and specifically sensitive to Methanol may require additional protective equipment.
Storage:	Methanol should be protected from temperature extremes and direct sunlight. Proper storage of Methanol must be determined based on other materials stored and their hazards and potential chemical incompatibility. In general, Methanol should be stored in an acceptably protected and secure flammable liquid storage room.
Other:	Emergency eyewash fountains and safety showers should be available in the vicinity of any potential exposure. Ground and bond metal containers to minimize static sparks.

VII. Spill and Disposal Data

Spill Control:	Protect from ignition. Wear protective clothing and use approved respirator equipment. Absorb spilled material in an absorbent recommended for solvent spills and remove to a safe location for disposal by approved methods. If released to the environment, comply with all regulatory notification requirements. CERCLA Reportable Quantity: 5,000 pounds.
Waste Disposal:	Dispose of Methanol as an EPA hazardous waste. Contact state environmental agency for listing of licensed hazardous waste disposal facilities and applicable regulations. Hazardous waste number: U154 (ignitable), F003 (ignitable).

Hazard Classification		Chemical Listings	
Immediate Health:	Yes	Extremely Hazardous Substances:	No
Delayed Health:	Yes	CERCLA Hazardous Substances:	Yes
Fire:	Yes	Toxic Chemicals:	Yes
Sudden Release:	No		
Reactive:	No		

Methanol is subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and 40CFR Part 372. This product does not contain any other toxic chemical above 1% concentration or a carcinogen above 0.1% concentration.

KEY

ca	Approximately	STEL	Short Term Exposure Level (15 minutes)
na	Not Applicable	TLV	Threshold Limit Value
C	Ceiling	TWA	Time Weighted Average
		BuAc	Butyl Acetate

CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
NSC	National Safety Council ("Fundamentals of Industrial Hygiene," 3rd Ed., 1988)

J.T.Baker
222 Red School Lane
Phillipsburg, NJ 08865
24-Hour Emergency Telephone 908-859-2151
National Response Center 800-424-8802
Chemtrec 800-424-9300

Outside U.S. and Canada
Chemtrec 202-483-7616

FICHE SIGNALÉTIQUE
HOJAS DE DATOS DE SEGURIDAD

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers are to be used on the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemi
All non-emergency questions should be directed to Customer Service (1-800-JTBAKER) for assistance

60 -04 Nitric Acid Page: 1
ffective: 05/01/89 Issued: 08/09/91

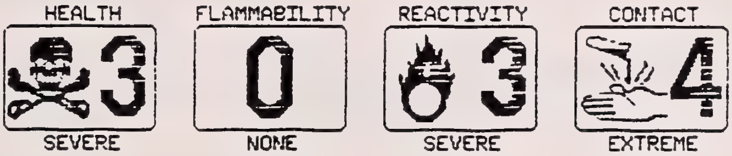
.T.BAKER INC., 222 Red School Lane, Phillipsburg, NJ 08865

SECTION I - PRODUCT IDENTIFICATION

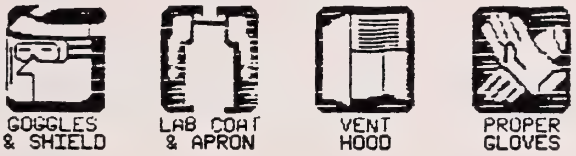
roduct Name:	Nitric Acid
ommon Synonyms:	Hydrogen Nitrate; Azotic Acid
hemical Family:	Inorganic Acids
ormula:	HNO_3
ormula Wt.:	63.01
AS No.:	7697-37-2
IOSH/RTECS No.:	QU5775000
roduct Use:	Laboratory Reagent
roduct Codes:	5555,9597,6901,9602,5801,9616,9605,5113,5371,4801,9604,9601 9600,9606,9598

PRECAUTIONARY LABELING

ER SAF-T-DATA* System



aboratory Protective Equipment



U.S. Precautionary Labeling

POISON! DANGER!

PILLAGE MAY CAUSE FIRE OR LIBERATE DANGEROUS GAS. HARMFUL IF INHALED AND MAY AUSE DELAYED LUNG INJURY. STRONG OXIDIZER. CONTACT WITH COMBUSTIBLE ATERIALS, FLAMMABLE MATERIALS, OR POWDERED METALS CAN CAUSE FIRE OR XPLOSION. LIQUID AND VAPOR CAUSE SEVERE BURNS. MAY BE FATAL IF SWALLOWED OR NHALED.

Continued on Page: 2

PRECAUTIONARY LABELING (CONTINUED)

eep from contact with clothing and other combustible materials. Do not store ear combustible materials. Do not get in eyes, on skin, on clothing. Do not reathe vapor. Keep in tightly closed container. Use with adequate entilation. Wash thoroughly after handling. In case of fire, use water pray. In case of spill, neutralize with soda ash or lime.

International Labeling

auses severe burns.
eep out of reach of children. Do not breathe vapour. In case of contact with yes, rinse immediately with plenty of water and seek medical advice. Take off mmediately all contaminated clothing.

AF-T-DATA* Storage Color Code: Yellow (reactive)

SECTION II - COMPONENTS

omponent	CAS No.	Weight %	OSHA/PEL	ACGIH/TLV
itric Acid	7697-37-2	65-71	2 ppm	2 ppm
ater	7732-18-5	29-35	N/E	N/E

SECTION III - PHYSICAL DATA

oiling Point: 121°C (249°F) (at 760 mm Hg)

Vapor Pressure (mmHg): 9 (20°C)

lting Point: -42°C (-43°F) (at 760 mm Hg)

Vapor Density (air=1): N/A

pecific Gravity: 1.41 (H_2O=1)

Evaporation Rate: N/A

olubility(H_2O): Complete (100%)

% Volatiles by Volume: 100 (21°C)

I: 1.0 (0.1M solution)

r Threshold (ppm): N/A

Physical State: Liquid

Continued on Page: 3

SECTION III - PHYSICAL DATA (CONTINUED)

efficient Water/Oil Distribution: N/A

ppearance & Odor: Clear, colorless liquid. Suffocating odor.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

lash Point (Closed Cup): N/A NFPA 704M Rating: 3-0-0 OXY

toignition Temperature: N/A

lammable Limits: Upper - N/A Lower - N/A

re Extinguishing Media
Use water spray.

ecial Fire-Fighting Procedures
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move exposed containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool; do not get water inside containers.

usual Fire & Explosion Hazards
Strong oxidizer. Contact with combustible materials, flammable materials, or powdered metals can cause fire or explosion. Reacts with most metals to produce hydrogen gas, which can form an explosive mixture with air. A violent exothermic reaction occurs with water. Sufficient heat may be produced to ignite combustible materials.

xic Gases Produced
oxides of nitrogen, hydrogen

plosion Data-Sensitivity to Mechanical Impact
None identified.

plosion Data-Sensitivity to Static Discharge
None identified.

Continued on Page: 4

SECTION V - HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): 5 mg/m³ (2 ppm)

Short-Term Exposure Limit (STEL): 10 mg/m³ (4 ppm)

Permissible Exposure Limit (PEL): 5 mg/m³ (2 ppm)

Toxicity of components

Inhalation-1Hr Rat LC_{50} for Nitric Acid	2500	ppm
Intraperitoneal Mouse LD_{50} for Water	190	g/kg
Intravenous Mouse LD_{50} for Water	25	g/kg

Carcinogenicity: NTP: No IARC: No Z List: No OSHA Reg: No

Carcinogenicity
None identified.

Reproductive Effects
None identified.

Effects of Overexposure

INHALATION:	severe irritation or burns of respiratory system, coughing, difficult breathing, chest pains, pulmonary edema, lung inflammation, unconsciousness, and may be fatal
SKIN CONTACT:	severe irritation or burns
EYE CONTACT:	severe irritation or burns
SKIN ABSORPTION:	none identified
INGESTION:	nausea, vomiting, severe burns, ulceration - mouth, throat, stomach, and may be fatal
CHRONIC EFFECTS:	damage to lungs, teeth

Target Organs
eyes, skin, mucous membranes, respiratory system, lungs, teeth, GI tract

cal Conditions Generally Aggravated by Exposure
damaged skin, eye disorders, cardiopulmonary disease, lung disease

Continued on Page: 5

SECTION V - HEALTH HAZARD DATA (CONTINUED)

rimary Routes of Entry
inhalation, ingestion, eye contact, skin contact

mergency and First Aid Procedures

INGESTION: CALL A PHYSICIAN. If swallowed, do NOT induce vomiting. If conscious, give water, milk, or milk of magnesia.

INHALATION: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

SKIN CONTACT: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use.

EYE CONTACT: In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

SARA/TITLE III HAZARD CATEGORIES and LISTS

cute: Yes Chronic: Yes Flammability: Yes Pressure: No Reactivity: No

xtremely Hazardous Substance: Yes Contains Nitric Acid (RQ = 1,000 LBS, TPQ = 1,000 LBS)
ERCLA Hazardous Substance: Yes Contains Nitric Acid (RQ = 1000 LBS)
ARA 313 Toxic Chemicals: Yes Contains Nitric Acid
Generic Class: C16
SCA Inventory: Yes

SECTION VI - REACTIVITY DATA

ability: Stable Hazardous Polymerization: Will not occur

nditions to Avoid: heat, light, moisture

compatibles: strong bases, carbonates, sulfides, cyanides, combustible materials, organic materials, strong reducing agents, most common metals, powdered metals, carbides, ammonium hydroxide, water, alcohols

composition Products: oxides of nitrogen, hydrogen

Continued on Page: 6

SECTION VII - SPILL & DISPOSAL PROCEDURES

Steps to be Taken in the Event of a Spill or Discharge

Wear self-contained breathing apparatus and full protective clothing. Stop leak if you can do so without risk. Ventilate area. Neutralize spill with soda ash or lime. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

Keep combustibles (wood, paper, oil, etc.) away from spilled material.

J. T. Baker NEUTRASORB^R or TEAM^R 'Low Na+' acid neutralizers are recommended for spills of this product.

Disposal Procedure

Dispose in accordance with all applicable federal, state, and local environmental regulations.

EPA Hazardous Waste Number: D001, D002 (Ignitable, Corrosive Waste)

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

Ventilation:	Use general or local exhaust ventilation to meet TLV requirements.
Respiratory Protection:	Respiratory protection required if airborne concentration exceeds TLV. At concentrations up to 100 ppm, a chemical cartridge respirator with acid cartridge is recommended. Above this level, a self-contained breathing apparatus is advised.
Eye/Skin Protection:	Safety goggles and face shield, uniform, protective suit, neoprene gloves are recommended.

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA* Storage Color Code: Yellow (reactive)

Storage Requirements

Keep container tightly closed. Store separately and away from flammable and combustible materials. Isolate from incompatible materials. Keep product out of light.

Continued on Page: 7

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

Domestic (D.O.T.)

Proper Shipping Name: Nitric acid (over 40%)
Hazard Class: Oxidizer
UN/NA: UN2031 Reportable Quantity: 1000 LBS.
Labels: OXIDIZER, CORROSIVE
Regulatory References: 49CFR 172.101; 173.268

International (I.M.O.)

Proper Shipping Name: Nitric acid
Hazard Class: 8 I.M.O. Page: 8185
UN: UN2031 Marine Pollutants: No Packaging Group: II
Labels: CORROSIVE
Regulatory References: 49CFR 172.102; Part 176; IMO

(I.C.A.O.)

Proper Shipping Name: Nitric acid
Hazard Class: 8
UN: UN2031 Packaging Group: II
Labels: CORROSIVE
Regulatory References: 49CFR 172.101; 173.6; Part 175; ICAO/IATA

U.S. Customs Harmonization Number: 28080000000

N/A = Not Applicable or Not Available
N/E = Not Established

The information in this Material Safety Data Sheet meets the requirements of the United States OCCUPATIONAL SAFETY AND HEALTH ACT and regulations promulgated thereunder (29 CFR 1910.1200 et. seq.) and the Canadian WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM. This document is intended only as a guide to the appropriate precautionary handling of the material by a person trained in, or supervised by a person trained in, chemical handling. The user is responsible for determining the precautions and dangers of this chemical for his or her particular application. Depending on usage, protective clothing including eye and face guards and respirators must be used to avoid contact with material reathing chemical vapors/fumes.
Exposure to this product may have serious adverse health effects. This chemical may interact with other substances. Since the potential uses are so varied, Baker cannot warn of all of the potential dangers of use or interaction with other chemicals or materials. Baker warrants that

Continued on Page: 8

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ıe chemical meets the specifications set forth on the label.
ıKER DISCLAIMS ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED WITH REGARD
THE PRODUCT SUPPLIED HEREUNDER, ITS MERCHANTABILITY OR ITS FITNESS
)R A PARTICULAR PURPOSE.
ıe user should recognize that this product can cause severe injury and
en death, especially if improperly handled or the known dangers of use
e not heeded. READ ALL PRECAUTIONARY INFORMATION. As new documented
neral safety information becomes available, Baker will periodically
vise this Material Safety Data Sheet.
te: CHEMTREC, CANUTEC, and NATIONAL RESPONSE CENTER emergency telephone
mbers are to be used ONLY in the event of CHEMICAL EMERGENCIES involving
spill, leak, fire, exposure, or accident involving chemicals. All
n-emergency questions should be directed to Customer Service
-800-JTBAKER) for assistance.

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roved by Quality Assurance Department.

-- LAST PAGE --

ATI ORION MATERIAL SAFETY DATA SHEET

Analytical Technology Incorporated

Sheet 1 of 2

Orion Research
THE SCHRAFFT CENTER
529 Main Street, Boston, MA 02129 USA
Telephone 617-242-3900

I. PRODUCT IDENTIFICATION

Product Name Orion Application Solution-pH Electrode Storage Solution	Catalog No. 910001	Effective Date 11/27/94
Hazardous Shipment Labelling:	DOT None	IATA None
Prepared By	Title Quality Assurance Chemist	
Approved By	Title Director Regulatory Matters	

II. HAZARDOUS INGREDIENTS (IDENTIFY INFORMATION)

Hazardous Components* Specific Chemical Identity: Common Name(s)	CAS NO.	%	OSHA PEL	ACGIH TLV	LD 50mg/Kg
Potassium Chloride (KCl)**	7447-40-7	11.1	None	None	2600 (ORL-RAT)
Potassium Phosphate Monobasic (KH_2PO_4)	7778-77-0	0.17	None	None	NA*
Sodium Phosphate Dibasic (Na_2HPO_4)	7558-79-4	0.18	None	None	1,070 (IVN-RBT)
**Deionized Water (H_2O)	7732-18-5	88.55	None	None	190,000 (IPR-MUS)

III. PHYSICAL DATA

Boiling Point 760 mm Hg 100°C	Freezing Point -3°C
Specific Gravity (H_2O=1) 1.05	Vapor Pressure @
pH @ °C 25 6.3 - 6.9	Solubility In Water, % By Wt @ Miscible
Volatiles, % By Wt. NA	Evaporation Rate (BUTYL ACETATE = 1) NA
Vapor Density (AIR = 1) NA	
Appearance and Odor Clear, colorless, odorless liquid	

IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point (Test Method) NA	Autoignition Temperature NA	
Flammable Limits in air, % by volume:	Lower NA	Upper NA
Extinguishing Media Any		
Special Fire-Fighting Procedures None, this solution is non-flammable		
Unusual Fire and Explosion Hazards None		

* Chemicals which are not classified as hazardous per U.S. OSHA guidelines (29CFR Parts 1915.2 or 1916.2) or the Massachusetts Substance List (105CMR670.000 Appendix A) will not necessarily be listed on this form even though one or more may be a constituent of this product
* NA Not available/not applicable

** Non-hazardous component

Liability is expressly disclaimed for any loss or injury arising out of the use of this information or the use of any materials designated. Safe use of the materials is the responsibility of the user.

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Rev. C

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ATI ORION MATERIAL SAFETY DATA SHEET

Analytical Technology Incorporated
Sheet 2 of 2

PRODUCT NAME: Orion Application Solution pH Electrode Storage Solution **Catalog No.: 910001**

V. REACTIVITY DATA

Stability: Unstable	Stable X	**Conditions to Avoid** None
Incompatibility (Materials to avoid)		Magnesium and sodium metals
Hazardous Decomposition Products May emit toxic POx fumes if heated to decomposition		
Hazardous Polymerization: May Occur	Will Not Occur X	**Condition to Avoid** Heating to decomposition

VI. HEALTH HAZARD DATA

Route(s) Of Entry: No	**Inhalation?**	**Skin?** No	**Ingestion?** No
Health Hazards (acute and chronic) Low hazard for both acute and chronic because of low concentration of phosphate salts. This composition os also used as a buffer in pharmaceuticals.			
Carcinogenicity: Not found on these lists.	**NTP?**	**IARC Monographs?**	**OSHA Regulated?**
Signs and Symptoms of Exposure Irritation of skin			
Medical Conditions Generally Aggravated By Exposure	Could aggravate diseases of the skin		
Emergency And First Aid Procedures Wash off contact area with soap and water. Internal: dilute with water and consult physician			

VII. PRECAUTIONS (SAFE HANDLING AND USE)

Steps To Be Taken In Case Material Is Released Or Spilled Clean up and wash down drain if local law allows.
Waste Disposal Method Wash down drain. Observe all Federal, State, and local laws when disposing of this product.
Precautions To Be Taken In Handling And Storing NFPA Rating: Scale (0–4): Health - 1, Fire - 0, Reactivity -0, Specific - None.
Other Precautions SARA TITLE III Na_2HPO_4 is a CERCLA hazard and releases are subject to Section 304 of Title III. Not found on Cal Prop 65 Components reported in EPA TSCA inventory.

VIII. CONTROL MEASURES

Respiratory Protection (specify type) None			
Ventilation	**Local Exhaust** None	**Special** None	
Ventilation	**Mechanical (General)** None	**Other** None	
Protective Gloves	None	**Eye Protection**	Safety glasses
Other Protective Clothing Or Equipment Eye wash station should be available			
Work/Hygienic Practices No eating or drinking in work area			

ATI ORION MATERIAL SAFETY DATA SHEET

Sheet 1 of 2

Orion Research Incorporated
THE SCHRAFFT CENTER
529 Main Street, Boston, MA 02129 USA
Telephone 617-242-3900

I. PRODUCT IDENTIFICATION

Product Name Orion Application Solution pH 7.00 Buffer	Catalog No. 910107	EffectiveDate 07/01/94
Hazardous Shipment Labelling:	DOT NA	IATA NA
Prepared By	Title Quality Assurance Chemist	
Approved By	Title Director Regulatory Matters	

II. HAZARDOUS INGREDIENTS (IDENTIFY INFORMATION)

Hazardous Components* Specific Chemical Identity: Common Name(s)	CAS NO.	%	OSHA PEL	ACGIH TLV	LD 50mg/Kg
Sodium Phosphate (Na_2PO_4)	7558-79-4	0.413	None	None	298 (IVN-DOG)
Sodium Chromate (Na_2CrO_4)	7775-11-3	0.013	50ug/m3	None	117 (PR-MUS)
Potassium Phosphate (KH_2PO_4)	7778-77-0	0.284	None	None	None listed
Potassium Dichromate ($K_2Cr_2O_7$)	778-50-9	0.0305	50ug/m3	50ug/m3	37 (IPR-RAT)
**Deionized Water (H_2O)	7732-18-5	99.2595	None	None	190.000 (PR-MUS)

III. PHYSICAL DATA

Boiling Point 750 mm Hg 100°C	Freezing Point 0°C
Specific Gravity (H₂O=1) 1.0	Vapor Pressure @ NA***
pH @ °C 25 7.00	Solubility In Water, % By Wt @ Miscible
Volatiles, % By Wt. NA	Evaporation Rate (BUTYL ACETATE = 1) NA
Vapor Density (AIR = 1) NA	
Appearance and Odor Light yellow , odorless liquid	

IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point (Test Method) Not flammable	Autoignition Temperature NA	
Flammable Limits in air, % by volume:	Lower NA	Upper NA
Extinguishing Media Water, CO_2, Dry chemical, foam or spray		
Special Fire-Fighting Procedures None, non-flammable		
Unusual Fire and Explosion Hazards None		

* Chemicals which are not classified as hazardous per U.S. OSHA guidelines (29CFR Parts 1915.2 or 1916.2) or the Massachusetts Substance List (105CMR670.000 Appendix A) will not necessarily be listed on this form even though one or more may be a constituent of this product

* NA Not available/not applicable

** Non-hazardous component

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ATI ORION MATERIAL SAFETY DATA SHEET

Sheet 2 of 2

PRODUCT NAME: Orion Application Solution pH 7.00 Buffer **Catalog No.:** 910107

V. REACTIVITY DATA

Stability:		Conditions to Avoid
Unstable	Stable X	None
Incompatibility (Materials to avoid)	Mg and Na+ Metals	
Hazardous Decomposition Products When heated, phosphates can emit highly toxic fumes; but, for the amount of phosphates present in this solution, it can be considered non-hazardous.		
Hazardous Polymerization:		Condition to Avoid
May Occur	Will Not Occur X	None

VI. HEALTH HAZARD DATA

Route(s) Of Entry:	Inhalation?	Skin?	Ingestion?
	No	No	Yes
Health Hazards (acute and chronic) Low hazard for acute and chronic beacuse of low concentration of salt.			
Carcinogenicity:	NTP?	IARC Monographs? ***	OSHA regulated?
	Not found on these lists		
Signs and Symptoms of Exposure Skin irritation			
Medical Conditions Generally Aggravated By Exposure Could aggravate diseases of the skin.			
Emergency And First Aid Procedures Wash off contact area with water. If ingested, give large amounts of water. Contact physician.			

VII. PRECAUTIONS (SAFE HANDLING AND USE)

Steps To Be Taken In Case Material Is Released Or Spilled Wash down drain with excess water if local law allows.
Waste Disposal Method Consult Federal, State and Local laws when disposing of this product.
Precautions To Be Taken In Handling And Storing Suitable for any general handling and storage. NFPA Rating: Scale (0–4): Health -0, Fire-0, Reactivity-0, Specific-none.
Other Precautions SARA TITLE III: Releases of (Na_2HPO_4) are subject to reporting under Section 304 of this Act and CERCLA. Not affected by CAL Prop 65. Components are listed in the TSCA inventory.

VIII. CONTROL MEASURES

Respiratory Protection (specify type) None	
Ventilation Local Exhaust No	Special No
Ventilation Mechanical (General) No	Other No
Protective Gloves No	Eye Protection Safety glasses
Other Protective Clothing Or Equipment No	
Work/Hygienic Practices No eating or drinking while working with this product	

ATI ORION MATERIAL SAFETY DATA SHEET

Sheet 1 of 2

Orion Research Incorporated
THE SCHRAFFT CENTER
529 Main Street, Boston, MA 02129 USA
Telephone 617-242-3900

I. PRODUCT IDENTIFICATION

Product Name Orion Application Solution pH 10.01 Buffer	**Catalog No.** 910110	**EffectiveDate** 07/20/93
Hazardous Shipment Labelling: DOT NA	IATA NA	
Prepared By	**Title** Quality Assurance Chemist	
Approved By	**Title** Director Regulatory Matters	

II. HAZARDOUS INGREDIENTS (IDENTIFY INFORMATION)

Hazardous Components* Specific Chemical Identity: Common Name(s)	CAS NO.	%	OSHA PEL	ACGIH TLV	LD 50mg/Kg
Sodium Bicarbonate ($NaHCO_3$)	144-55-8	0.209	None	None	4220 (ORL-RAT)
Sodium Carbonate (Na_2CO_3)	497-19-8	0.264	None	None	117 (PR-MUS)
Methylparaben ($C_8H_8O_3$)	99-76-3	0.001	None	None	NA
FD&C Blue ($C_{37}H_{36}N_2O_9S_3 \cdot 2Na$)	384445-9	0.0005	None	None	5.5g/Kg (SEN-RAT)LD Lo
**Deionized Water (H_2O)	7732-18-5	99.526	None	None	190,000 (PR-MUS)

III. PHYSICAL DATA

Boiling Point 750 mm Hg 100°C	**Freezing Point** 0°C
Specific Gravity ($H_2O=1$) 1.0	**Vapor Pressure @** NA
pH @ °C 25 10.01	**Solubility In Water, % By Wt @** Miscible
Volatiles, % By Wt. NA	**Evaporation Rate** (BUTYL ACETATE = 1) NA
Vapor Density (AIR = 1) NA	
Appearance and Odor Light blue, odorless liquid	

IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point (test Method) Not flammable	**Autoignition Temperature** NA	
Flammable Limits in air, % by volume:	**Lower** NA	**Upper** NA
Extinguishing Media Water, CO_2, Dry chemical, foam or spray		
Special Fire-Fighting Procedures None, non-flammable		
Unusual Fire and Explosion Hazards None		

* Chemicals which are not classified as hazardous per U.S. OSHA guidelines (29CFR Parts 1915.2 or 1916.2) or the Massachusetts Substance List (105CMR670.000 Appendix A) will not necessarily be listed on this form even though one or more may be a constituent of this product
* NA Not available/not applicable
** Non-hazardous component

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ATI ORION MATERIAL SAFETY DATA SHEET

Sheet 2 of 2

PRODUCT NAME: Orion Application SolutionpH 10.01 Buffer **Catalog No.:** 910110

V. REACTIVITY DATA

Stability:		**Conditions to Avoid**
Unstable	Stable X	None
Incompatibility (Materials to avoid)	NaK alloy, $NH_4H_2PO_4$, AL, P_2O_5, H_2SO_4	
Hazardous Decomposition Products	CO_2 Upon heating to decomposition	
Hazardous Polymerization:		**Condition to Avoid**
May Occur	Will Not Occur X	None

VI. HEALTH HAZARD DATA

Route(s) Of Entry:	**Inhalation?**	**Skin?**	**Ingestion?**
	No	Yes	Yes
Health Hazards (acute and chronic) Acute: This solution is considered non-hazardous due to the low levels of salt present. Chronic: Possible irritation of skin upon prolonged exposure.			
Carcinogenicity:	**NTP?**	**IARC Monographs?** ***	**OSHA regulated?**
	Not found	(animal positive)	Not found
Signs and Symptoms of Exposure Skin irritation			
Medical Conditions Generally Aggravated By Exposure Could aggravate diseases of the skin.			
Emergency And First Aid Procedures Wash off contact area with water. If ingested, give large amounts of water. Contact physician.			

VII. PRECAUTIONS (SAFE HANDLING AND USE)

Steps To Be Taken In Case Material Is Released Or Spilled Clean up and set aside for disposal.
Waste Disposal Method Consult Federal, State and Local laws for proper disposal.
Precautions To Be Taken In Handling And Storing Suitable for any general handling and storage. NFPA Rating: Scale (0-4); Health -1, Fire-0, Reactivity-0, Specific-none.
Other Precautions FD&C Blue No. 1 is listed on CAL Prop 65

VIII. CONTROL MEASURES

Respiratory Protection (specify type) None	
Ventilation **Local Exhaust** No	**Special** No
Ventilation **Mechanical (General)** No	**Other** No
Protective Gloves Yes	**Eye Protection** Safety glasses
Other Protective Clothing Or Equipment No	
Work/Hygienic Practices No eating or drinking while working with this product	

ORION MATERIAL SAFETY DATA SHEET

SHEET 1 OF 2

Orion Research Incorporated
THE SCHRAFFT CENTER
529 MAIN STREET, BOSTON, MA 02129 USA
TELEPHONE 617-242-3900

I. PRODUCT IDENTIFICATION

PRODUCT NAME Orion Application Solution pH 4.01 Buffer	CATALOG NO. 910104 or 330004	EFFECTIVE DATE 8/26/92
HAZARDOUS SHIPMENT LABELLING: DOT None	IATA None	
PREPARED BY	TITLE Quality Assurance Chemist	
APPROVED BY	TITLE Director Regulatory Matters	

II. HAZARDOUS INGREDIENTS (IDENTITY INFORMATION)

HAZARDOUS COMPONENTS* SPECIFIC CHEMICAL IDENTITY; COMMON NAME(S)	CAS NO.	%	OSHA PEL	ACGIH TLV	LD 50 mg/Kg
Potassium Hydrogen Phthalate (KHP)	877-24-7	1.01	None	None	NA*
Amaranth Red Dye ($C_{20}.H_{11}.N_2.O_{10}.S_2•3Na$)	915-67-3	0.0005	None	None	1,000 (IPR-MUS)
*Deionized Water (H_2O)	7732-18-5	98.99	NA	NA	190,000 (IPR-MUS)

III. PHYSICAL DATA

BOILING POINT 760 mm Hg 100°C	FREEZING POINT 0°C
SPECIFIC GRAVITY (H_2O = 1) 1.0	VAPOR PRESSURE @ NA
pH @ °C 25 4.01	SOLUBILITY IN WATER, % BY WT. @ Miscible
VOLATILES, % BY WT. NA	EVAPORATION RATE (BUTYL ACETATE = 1) NA
VAPOR DENSITY (AIR = 1) NA	
APPEARANCE AND ODOR Light red, odorless liquid	

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (TEST METHOD) Not flammable	AUTOIGNITION TEMPERATURE NA	
FLAMMABLE LIMITS IN AIR, % BY VOLUME:	LOWER NA	UPPER NA
EXTINGUISHING MEDIA Water, CO_2, Dry chemical, foam or spray		
SPECIAL FIRE-FIGHTING PROCEDURES None, non-flammable		
UNUSUAL FIRE AND EXPLOSION HAZARDS None		

* Chemicals which are not classified as hazardous per U.S. OSHA guidelines (29CFR Parts 1915.2 or 1916.2) or the Massachusetts Substance List (105CMR670.000 Appendix A) will not necessarily be listed on this form even though one or more may be a constituent of this product.

* Not available or not applicable.

** Non-hazardous component.

*** Refers to Amaranth Red Dye

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ORION MATERIAL SAFETY DATA SHEET

SHEET 2 OF 2 Orion Application Solution

PRODUCT NAME: pH 4.01 Buffer CATALOG NO.: 910104 or 330004

V. REACTIVITY DATA

STABILITY:		CONDITIONS TO AVOID
UNSTABLE ○	STABLE ☑	None
INCOMPATIBILITY (MATERIALS TO AVOID)		HNO_3
HAZARDOUS DECOMPOSITION PRODUCTS		None
HAZARDOUS POLYMERIZATION:		CONDITION TO AVOID
MAY OCCUR ○	WILL NOT OCCUR ☑	None

VI. HEALTH HAZARD DATA

ROUTE(S) OF ENTRY:	INHALATION? No	SKIN? Yes	INGESTION? Yes

HEALTH HAZARDS (ACUTE AND CHRONIC)
Acute - low hazard for acute because of low concentration of salts. Chronic. possible skin irritant for prolonged exposure

CARCINOGENICITY:	NTP? Amaranth is suspected/Not found	IARC MONOGRAPHS? (animal positive)***	OSHA REGULATED? not found

SIGNS AND SYMPTOMS OF EXPOSURE
Skin irritation

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE Could aggravate diseases of the skin

EMERGENCY AND FIRST AID PROCEDURES
Wash off contact area with water. If ingested, give large amounts of water Contact physician.

VII. PRECAUTIONS (SAFE HANDLING AND USE)

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Wash down drain with excess water if local law allows.

WASTE DISPOSAL METHOD
onsult with and observe all Federal, State, and local laws when disposing of this product

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
uitable for any general handling and storage. NFPA Rating: Scale (0-4); Health - 1, Fire - 0, Reactivity - 1, Specific - none

THER PRECAUTIONS
This product is not regulated under SARA TITLE III Not affected by CAL Prop 65.

VIII. CONTROL MEASURES

ESPIRATORY PROTECTION (SPECIFY TYPE) None			
ENTILATION	LOCAL EXHAUST No	SPECIAL No	
	MECHANICAL (GENERAL) No	OTHER No	
PROTECTIVE GLOVES Yes		EYE PROTECTION Safety glasses	
THER PROTECTIVE CLOTHING OR EQUIPMENT No			
WORK/HYGIENIC PRACTICES No eating or drinking while working with this product.			

APPENDIX 2
PROJECT FORMS

EMPLOYEE/VISITOR DAILY ROSTER*

PROJECT NO. ____________________ SITE NAME: ________________________________

DATE: ____________________________ PROJECT MANAGER: __________________________

DATE	NAME	COMPANY	TIME ONSITE	TIME OFFSITE

* This roster is required for emergency response planning. All personnel arriving to and from the site must sign this roster. This log does not replace the H&S Orientation.

OGDEN

SITE VISITOR HEALTH AND SAFETY

ORIENTATION FORM

SITE ____

SITE HEALTH AND SAFETY COORDINATOR ____________________

SITE DESCRIPTION ______________________________________

____

____

____

____

____

POSSIBLE SITE CONTAMINANTS AND HAZARDS ________________

____

____

____

____

The information summarized below is important for you to read and fully understand. This information has been extracted from the site-specific Health and Safety Plan, and has been compiled to help ensure your health and safety onsite. If you have any questions regarding the information presented below, please ask your escort for clarification.

HEALTH, SAFETY, AND SECURITY INFORMATION

1. You must sign in and out of the Visitor Log Book maintained at the site. This assists in identifying all the visitors at the site in the event of an emergency.

2. If your business takes you beyond the designated VISITOR'S AREAS, you must be escorted. If you are observed unescorted in an unauthorized area, you will be asked to leave immediately.

3. Areas marked with yellow-and-black tape stating "CAUTION - DO NOT ENTER" demarcate where the Exclusion (contaminated) areas begin. You are not allowed to enter these areas.

4. Access to the contaminated area is strictly forbidden to all visitors unless they have approval of the client and can produce adequate written proof of adequate training and medical certification prior to arrival onsite.

5. Hard hats and visitor safety glasses must be worn at all times onsite. Your escort will provide you with this safety equipment.

6. Please read and follow all safety signs onsite. The signs are there to alert you to possible physical and chemical hazards.

7. Eating and smoking is not allowed onsite. You may eat or smoke in designated clean areas or in your vehicle.

8. Please be cautious around heavy or moving equipment and vehicles.

9. Report any accident or injury to your escort.

10. No one under the age of 18 is permitted onsite without prior approval of the client.

11. No domestic animals are permitted onsite.

12. Please do not disrupt site activities or contribute to any unnecessary delays.

EMERGENCY NOTIFICATION

1. In the event of a site emergency, please walk immediately to the designated meeting area for the site. You will receive further instructions at this location. Please stay in this meeting area until the all-clear signal is given from the Site Health and Safety Coordinator or offsite emergency support personnel.

2. Please cooperate fully with those in authority in the event of an emergency.

ACKNOWLEDGEMENT OF INFORMATION

I have read and understand the above information provided by OEES and have had an opportunity to direct questions of a health and safety nature, and have received adequate answer or explanations from my escort or other site staff member. My signature also indicates that my employer assumes the risk of any injury or property damage that may occur to me or by me.

Visitor Signature	Print Name	Affiliation	Date

OGDEN

SUBCONTRACTOR HEALTH AND SAFETY ORIENTATION FORM

SITE ____

SITE HEALTH AND SAFETY COORDINATOR ____________________

SITE DESCRIPTION ____________________________________

____

____

____

____

____

POSSIBLE SITE CONTAMINANTS AND HAZARDS ________________

____

____

____

____

The information summarized below is important for you to read and fully understand. This information has been extracted from the site-specific Health and Safety Plan, and has been compiled to help ensure your health and safety onsite. If you have any questions regarding the information presented below, please ask your escort for clarification.

HEALTH, SAFETY AND SECURITY INFORMATION

1. All subcontracting personnel must acknowledge their presence onsite by checking in with the Site Health and Safety Coordinator. This assists in identifying all the personnel at the site in the event of an emergency.

2. All subcontracting personnel will be restricted to their "contracted" area(s). Do not enter any of the contaminated areas (marked with yellow-and-black caution tape) unless you have been authorized by site management and are wearing the proper protective equipment.

3. Hard hats, safety glasses, and safety boots are REQUIRED to be worn while you are working onsite.

4. Please read and heed all safety signs onsite. These signs are there to alert you to possible physical and chemical hazards.

5. Eating and smoking is not allowed onsite. You may eat or smoke in designated clean areas or in your vehicle.

6. Shirts are required at all times; long-sleeved shirts are preferred.

7. Before beginning any HOT WORK (welding, burning, and grinding) you must notify the Site Health and Safety Coordinator. The work area must be checked for flammable and combustibles, and to be sure that the proper fire extinguisher is close by before beginning the hot work.

8. Observe the proper lockout/tagout procedure before working on electrical and/or rotating equipment.

9. Normal subcontractor shift hours coincide with the regular OEES work schedule.

10. Report any accident or injury (even if minor to you) to the Site Health and Safety Coordinator.

11. No one under the age of 18 is permitted onsite without prior approval of the client.

12. No domestic animals are permitted onsite.

13. Complete cooperation with the Health and Safety Plan must be maintained. Any violation may result in expulsion from the site.

14. In the event of an onsite emergency, please walk immediately to the designated meeting area for the site. You will receive further instructions from this location. Please stay in the meeting area until the all-clear signal is given from the Site Health and Safety Coordinator or offsite emergency support personnel.

15. Please cooperate fully with those in authority in the event of an emergency.

ACKNOWLEDGEMENT OF INFORMATION

I have read and understand the above information provided by OEES and have had an opportunity to direct questions of a health and safety nature, and have received adequate answer or explanations from my escort or other site staff member.

Subcontractor Signature	**Print Name**	**Affiliation**	**Date**

OGDEN TAILGATE SAFETY MEETING REPORT

Date ______________________ Site ______________________

Attendees ______________________

____

____

ORDER OF BUSINESS

Topic(s) discussed ______________________

____

____

Safety Suggestions ______________________

____

____

Action taken on previous meeting suggestions ______________________

____

____

Emergency information ______________________

____

____

Injuries and accidents since previous meeting ______________________

____

____

Additional comments ______________________

____

____

Meeting conducted by ______________________ Title ______________________

Signature ______________________ Date/Time ______________________

OGDEN

INSTRUMENT CALIBRATION LOG

Project: ____________________

JOB #_ ____________________

Location: ____________________

Date/Time	Instrument	Serial Number	Span Gas Substance	Span Conc.	Instrument Reading at Calibration	Instrument Calibration Reading Post Sampling	Comments

OGDEN

MACHINERY & MECHANIZED EQUIPMENT CERTIFICATION FORM

To: Ogden Environmental and Energy Services Co., Purchasing Department

From:

1. This provides certification of machinery and mechanized equipment to be used on the referenced project for the following work:

Description of equipment work:

Project Site:

Subcontractor providing equipment:

Dates (duration) of equipment work:

2. Inspection and certification of machinery and mechanized equipment, as required by Ogden policy, Corporate Health and Safety Manual, Volume II, Comprehensive Field Project Health and Safety Program, has been made prior to, but not earlier than seven (advance) calendar days, of use on the project site. Recertification will be required for equipment that is used on the project site for more than one year.

Identification of equipment (make model, serial no.)	Date of Certification
1.	
2.	
3.	
4.	
5.	
6.	

3. The above listed equipment has been inspected and tested as indicated above, and is CERTIFIED TO BE IN SAFE OPERATING CONDITION BY THE FOLLOWING COMPETENT INDIVIDUAL:

Name

Title

Firm

Signature

4. If there are any questions on this certification, please contact the following Ogden representative:

OGDEN

Purchasing forward completed copy to : Project Manager/Field Manager
Ogden Site Health and Safety Coordinator

DAILY DRILL RIG CHECKLIST

Date ______________________ Rig Description ________________

Project # ______________________ Serial or License # ________________

(Note: This # should match the # on the equipment certification form.)

Location ______________________ Rig Owner ________________

Item Name	Requirement	Yes	No*	Comment
Hydraulic systems controls and levers	No leaking fittings or connections. Levers are in good operating condition. Fluid levels are full.			
Fuel, oil, water, and coolant lines	No leaks.			
Hoses	No leaks in hoses or connections. No signs of excessive wear, kinked or bent hoses.			
Gauges	Operational and visible to operator.			
Emergency kill switch and life line	Operational and accessible to operator.			
Shear pins	In place.			
Drive chains	No signs of excessive wear, broken or defective links.			
Parking brakes	Set and operational.			
Outriggers	No leaks. Set on pads (as necessary to avoid damage).			
Windshield wipers	Operational.			
Lights (head, tail and running lights)	Operational and without cracked lenses.			
Cables and ropes	No fraying, birdnesting, flattening, stretching. Must be braided or properly clamped at connections.			
Back-up alarm	Operational, spotter used.			

DAILY DRILL RIG CHECKLIST (Continued)

Item Name	Requirement	Yes	No*	Comment
Pulleys, drums and spools	No excessive wear or cracking.			
Derrick/Mast	Locked in position. Frame is not cracked or bent.			
Hoists	Properly spooled cable, rated to lift loads.			
Safety equipment	Safety harness, fire extinguisher, flares, safety reflectors, first aid kit, grounding wire for fueling, and spill response equipment (for fueling & repairs).			
Guards	Power take-offs (PTOs) and all rotating parts designed with guards. Guards must have warning labels.			
Miscellaneous (as applicable)	Diverter systems; auger and head seals; cyclones; grout plant guards; etc. (list):			

* Deficiencies (Explain all negative responses and list corrective actions; all deficiencies must be corrected before the rig is entered into service):

____

____

____

____

Other Repairs or Routine Maintenance: ________________________

____

____

____

Inspection Conducted and
Rig Certified by:
(Owner/Operator)
____
Name and Date

Report Reviewed by:
(Ogden SHSC or FM)
____
Name and Date

DAILY BACKHOE CHECKLIST

Date ____________________

Project # ____________________

Location ____________________

Backhoe Description ____________________

Serial or License # ____________________
(Note: This # should match the # on the equipment certification form.)

Backhoe Owner ____________________

Item Name	Requirement	OK	No*	Comment
Hydraulic systems controls and levers	Leaking fittings or connections. Levers are in good operating condition. Levels of fluid are full.			
Fuel, oil, water, and coolant lines	Any leaks.			
Hoses	Leaks in hoses or connections. Signs of excessive wear, kinked or bent hoses.			
Bucket Operations	Front loader hinge pins with lock rings. Rear bucket upper and lower shaft pins and lock rings in place. Safety vertical lock operational.			
Brake System	Foot brakes operational. Emergency brakes operational.			
Cylinders	Leaking seals, deep scratches on chrome rams.			
Outriggers	Pads in place. Engine off. Safety check of internal fluid bypass. Any leaks.			
Lights (turn signals, emergency flashers).	Operational and without cracked lenses.			

* Deficiencies (Explain all negative responses and list corrective actions; all deficiencies must be corrected before the backhoe is entered into service):

____

____

____

Other Repairs or Routine Maintenance Performed this Date: ____________________

____

____

Inspection Conducted
and Certified by:
(Owner/Operator)

____
Name and Date

Report Reviewed by:
(Ogden SHSC or FM)

____
Name and Date

OGDEN

CONFINED SPACE ENTRY PERMIT

This permit (or a copy) shall be posted, when completed, at the entrance to the confined space before authorized entrants are allowed to enter. This permit is revoked if conditions in the confined space change and are no longer acceptable under the guidelines of this permit.

Date of issue: ____________________ Expiration Date: ____________________

Entry time: ____________________ Expiration Time: ____________________

Location of Space: ____

Description of Space: ____

Purpose of Entry: ____

Attendant(s): ____

Authorized Entrant(s): ____

HAZARD ASSESSMENT	YES	NO	HAZARD ASSESSMENT	YES	NO
Oxygen deficiency (<19.5%)			Materials harmful to the skin		
Combustible gases (>10% of LEL)			Noise		
H_2S (>10 ppm)			Asbestos		
CO (25 ppm)			Electrical shock		
Other chemicals - List:			Heat stress		
List:			Darkness		

SAFETY EQUIPMENT	YES	NO	PERSONNEL PROTECTIVE EQUIP.	YES	NO
Lockout/tagout			Self-contained Breathing Apparatus		
Pipe lines capped blanked/purged, flushed			Airline Supplied Respirator w/ escape		
Mechanical ventilation			Air Purifying Respirator - Type:		
Area secure and signs posted			Five minute escape air bottles		
Retrieval system/tripod			Safety glasses and goggles		
Communication equipment			Hard Hat		
Monitoring instr. - Type:			Chemical resistant clothing - Type:		
Fire extinguisher - Type:			Protective boots and/or gloves		
Ground fault circuit interrupt			Hearing protection - Type:		
Lighting			Tripod, winch, body harness, and life line		
Other permits - Type:			Other:		

Tests to be performed:

	TIME:_____	TIME:_____	TIME:_____	TIME:_____	TIME:_____	TIME:_____
OXYGEN						
FLAMMABILITY						
H_2S						
CO						
OTHER						

Sampling Equipment:

Type	Model	Serial	Calibration (Yes/No)

Signature of person who conducted testing: ________________________________

Entry Supervisor (Print Name)	Signature	Date	Time

Rescue and Emergency Services Phone Number: ____________________

OGDEN

HOT WORK
(FLAME OR SPARK PRODUCING ACTIVITIES)
PERMIT

NOTE: THIS PERMIT IS GOOD FOR ONLY 24 hours
UNLESS PERMIT EXTENSION (BELOW) IS SIGNED

DATE: ____________________ **No.:** ____________________

START DATE: ____________________ START TIME: __________ AM/PM
PERMISSION GIVEN TO: ____________________
OF (Co.) ____________________ GROUP: ____________________
JOB/LOCATION OF BOUNDARIES ____________________

WORK DESCRIPTION ____________________

EQUIPMENT TO BE USED ____________________

VIOLATION OF ANY PERMIT REQUIREMENTS
WILL BE CAUSE FOR DISCIPLINARY ACTION.

(ü) if required or "N/A"	Initials	The Field Manager (FM) and Site Health and Safety Coordinator (SHSC) must check requirements below and initial after requirements have been met and **before this permit is valid**.
		Combustible gas test required initially. Time: ____________
		(Plus every __________hrs.)
		Continuous explosivity monitoring required at site.
		Safety observer (fire watch) Name: ____________________
		Fireproof blanket.
		Fire extinguisher ______________ (type/size)
		Lines disconnected and blanked.
		Respiratory Protection:.____________________ (type)
		Vessels and/or area clean of oil/combustibles.
		Vehicle entry permit.
		Fire protection services taken out of service.
		Inert gas purge required.
		Confined space entry permit.
		Distance of operation from flammables/combustibles.
		Lock out/tag out.
		Area to be roped off or otherwise isolated.
		Other special requirements

Permit Initiated by:______________ Co.: ____________________

Necessary restrictions are specified, requirements are met, and hot work may safely begin (SHSC/FM)____________________

HOT WORK WILL NOT BEGIN UNTIL REQUIREMENTS ARE MET, APPROVAL SIGNATURES ARE OBTAINED, AND PERMIT IS POSTED AT THE JOB SITE.

PERMIT EXTENSION

This permit has been extended for the period ____/____/____ from ________AM/PM to ________ AM/PM **only:**

Approved by (SHSC/FM): ____________________

OGDEN

INSTRUCTIONS FOR USE OF THIS PERMIT

This permit is to be used to control work which requires the use of sources of ignition within or near "the exclusion zone" by Company or Contractor personnel. Examples are

1. welding, burning, cutting, grinding, or soldering
2. sparks from power tools
3. electrical equipment not approved for hazardous areas
4. explosives, chemical fire hazards
5. motorized equipment used in exclusion zone

Process, then post this permit at job site before work starts. If area becomes unsafe or permit conditions are not being met, anyone may pull the permit, stop all work, and notify the FM or SHSC.

CAUTION

If an area becomes unsafe or permit conditions are not being met, anyone may pull the permit, stop all work, and notify the FM or SHSC.

CONTRACTOR MUST

1. Initiate permit, ensure that job is well defined, justifiable, and can be done safely.
2. Fill in the upper section then SIGN "requested by."
3. Review permit with FM the day before work is to be done. Give operations extra lead time if fire watch/standby manpower is required.
4. Ensure that craftsmen and the safety observer understand job boundaries, work precautions, restrictions, and conditions.
5. Prepare job site for work. Have required materials ready.

SHSC or FM MUST

1. Review permit with initiator to ensure work is defined, justifiable, and can be done safely. Advise Activity Rep., as required, of any unusual hot work planned.
2. Specify "Restrictions Required" via checks in boxes provided, nonapplicable restrictions must be labeled as N/A.
3. Arrange for fire watch/safety observer if required.
4. Sign "approved by" and date on line provided.
5. Ensure administrative training requirements have been met.

THE CRAFTSMAN MUST

1. Be aware of all permit restrictions.
2. Report to the SHSC or FM before starting work, when leaving job site, and before resuming work.
3. Shut down machines, power tools, welding rigs, etc., when leaving job site.
4. Keep work area clean.

SHSC	*Site Health & Safety Coordinator*
FM	*Field Manager*
Co	*Contractor or Company*

SITE AIR SURVEILLANCE RECORD

SITE INFORMATION

Page ____of____

JOB #:
SITE MANAGER:

DATE:
H&S COORDINATOR:

SITE LOCATION:

SITE CONDITIONS

SITE PERSONNEL:

TEMPERATURE:
RELATIVE HUMIDITY:
WIND SPEED & DIRECTION:

SAMPLE NO.	TIME	SAMPLE DESCRIPTION	LOCATION	INSTRUMENT	READING	COMMENTS

OGDEN

Page _____ of _____

SAMPLE NO.	TIME	SAMPLE DESCRIPTION	LOCATION	INSTRUMENT	READING	COMMENTS

OGDEN

WORKPLACE EXPOSURE MONITORING RECORD

Name ______________________

Social Security Number ______________________

Employer/Officer ______________________

Job Function ______________________

Project No. ______________________

Project Name ______________________

Project Dates ______________________

Project Location ______________________

SAMPLING METHOD

☐ Adsorber ______________________
☐ Detector Tube ______________________
☐ Dosimeter Badge ______________________
☐ Filter ______________________
☐ Impinger ______________________
☐ Meter ______________________
☐ Other ______________________

SAMPLE TYPE

☐ Area
☐ Background
☐ Biological
☐ Personal

WORK ZONE

☐ Contamination Reduction
☐ Exclusion
☐ Support
☐ Other ______________________

SAMPLE COLLECTION

Sample No. ______________________

Instrument Make/Model ______________________

Calibration Date ______________________

Sample Date ______________________

Collected By ______________________

Analyzed By ______________________

(Use reverse side for calculation and sketches as necessary.)

Sample Duration ______________________ (min.)

Sample Rate ______________________ (ml/min.)

Sample Volume ______________________ (L)

ATMOSPHERIC CONDITIONS

Humidity (%)
☐ Low 0-30
☐ Med 30-70
☐ High 70-100

Wind (mph)
☐ Light 0-5
☐ Moderate 5-20
☐ High >20

Temperature __________ °F

Direction ______________________

ANALYTICAL RESULTS

Contaminant	Concentration	Units	Analytical Method	Detection Limit

PPE WORN (✓ = Yes)

☐ Half-Face Purifying Respirator
☐ Full-Face Purifying Respirator
☐ Air-Supplied Respirator
☐ Disposable Respirator
☐ Chemical Cartridge
☐ HEPA Cartridge
☐ Disposable Coverall
☐ Chemical Gloves
☐ Chemical Boots
☐ Slicker
☐ Unknown
☐ Safety Glasses
☐ Goggles
☐ Hearing Protection
☐ Other ______________________
____
____

OTHER REPRESENTATIVE PERSONNEL

______________________ ______________________
______________________ ______________________
______________________ ______________________

GENERAL COMMENTS

____
____
____

GDEN

SUPERVISOR'S REPORT OF INJURY OR ILLNESS

NOTE In order to prevent accidents, it is necessary to know how and why they occur. State facts as accurately as possible. Accurate reporting of all facts will help in the preparation of the "Employer's Report." Submit your complete report within 24 hours to the appropriate HSM, Human Resources, the appropriate HSM, your office HSC, and Corporate HSD. If additional space is needed, use reverse side.

Name of Injured Employee		Department in Which Regularly Employed
Injury Date	Time a.m. p.m.	Date Employer Was Notified of Injury
Did Accident Occur on Employer's Premises? ☐ Yes ☐ No	Where? (Specify dept., job site, etc.)	Name of Witnesses

What was employee doing when injured? (walking, lifting, operating machines, etc.) Be specific.

Please describe fully the events that resulted in injury or occupational disease. Tell what happened and how it happened. (Do not describe nature of injury.)

What machine, tool, substance, or object was most closely connected with the injury? (e.g., machine the employee struck against or that struck him; the chemical that irritated his skin; in cases of strain, the thing he was lifting, pulling, etc.)

Nature of injury and part of body affected.

CAUSES OF ACCIDENT: CHECK ALL THAT APPLY

UNSAFE BUILDING OR WORKING CONDITIONS

- ☐ LAYOUT OF OPERATIONS
- ☐ LAYOUT OF MACHINERY
- ☐ UNSAFE PROCESSES
- ☐ IMPROPER VENTILATION
- ☐ IMPROPER SANITATION/HYGIENE
- ☐ IMPROPER LIGHT
- ☐ EXCESSIVE NOISE
- ☐ FLOORS OR PLATFORMS
- ☐ MISCELLANEOUS

HOUSEKEEPING

- ☐ IMPROPERLY PILED OR STORED MATERIAL
- ☐ CONGESTION

PHYSICAL HAZARDS OR EQUIPMENT

- ☐ INEFFECTIVELY GUARDED
- ☐ UNGUARDED
- ☐ GUARD REMOVED
- ☐ DEFECTIVE TOOLS
- ☐ DEFECTIVE MACHINES
- ☐ DEFECTIVE MATERIALS

INSTRUCTIONS AND TRAINING

- ☐ NONE
- ☐ INCOMPLETE
- ☐ ERRONEOUS
- ☐ NOT FOLLOWING INSTRUCTIONS
- ☐ OPERATING WITHOUT AUTHORITY
- ☐ WORKING AT UNSAFE SPEED
- ☐ INEXPERIENCE
- ☐ UNTRAINED IN PROCEDURE
- ☐ INCORRECT USE OF TOOL OR EQUIPMENT
- ☐ IMPROPER JUDGMENT
- ☐ IMPROPER LIFTING
- ☐ LIFTING EXCESSIVE WEIGHT

DISCIPLINE

- ☐ NOT FOLLOWING SAFETY RULES
- ☐ HORSEPLAY

APPAREL OR PERSONAL PROTECTIVE EQUIPMENT

- ☐ PROTECTIVE EQUIPMENT NOT USED
- ☐ UNSUITABLE PROTECTIVE EQUIPMENT
- ☐ UNSUITABLE CLOTHING OR FOOTWEAR

What can be done to prevent such an accident from happening again?

Approx. date condition will be corrected?	Signature of Supervisor:	Date:

OGDEN

FIRST-AID INCIDENT REPORT

Date of Report:

Date of Injury/Incident:

Report Completed by:

Description of the Injury/Incident: (time, location, event, description of injuries)

Name of Injured Person:

Employer:

Name of First-aid Providers(s):

Social Security No.:

Bloodborne Pathogen Exposure Incident Evaluation:

1. Was the First-aid Responder exposed to blood or other potentially infectious materials?

☐ Exposure Occurred (see question 2)
☐ No Exposure

2. Exposure occurred by contact with the following (check all that apply):

☐ Eye
☐ Mouth
☐ Other Mucous Membrane
☐ Non-intact Skin (cuts, abrasions)
☐ Needlestick
☐ Human Bite

Exposure Control Precautions Taken (check all that apply):

☐ Gloves
☐ Face Mask
☐ One-way CPR valve
☐ Eye Protection
☐ Immediate Personal Hygiene
☐ Previous HBV Immunization
☐ Recommended for HBV Immunization
☐ Other ______________________________.

Please attach this completed form with the Supervisor's Report of Injury or Illness, and the Accident/First-aid Incident Summary Log, and forward to the appropriate HSM, Human Resources, your Office Health and Safety Coordinator, and Corporate HSD.

OGDEN

Period Covered: ____________ Location: ____________

ACCIDENT/FIRST-AID INCIDENT SUMMARY LOG

Date/Time	Employee Name	Odgen Location/ Project	General[1] Description	First-Aid[2] Provided?	Medical Attention?	Comments	Universal Precautions Taken?
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							

[1] Attach completed Supervisor's Report of Injury or Illness

HEPATITIS B (HBV) VACCINATION DECLINATION

In accordance with 29 CFR 1910.1030, I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with the hepatitis B vaccine, at no charge to myself. However, I decline hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with hepatitis B vaccine, I can receive the vaccination series at no charge to me.

______________________________ Signature

______________________________ Date

______________________________ Printed Name

Distribution:

Corporate Health and Safety Manager
Human Resources Manager

OGDEN

INCIDENT REPORT

(Please Print Clearly)

Report Number: Report Date: Incident Date:

Project Title and Location:

Project Number:

Location of Incident:

Names of All Personnel Involved:

Describe the incident as it occurred (use additional sheets, if necessary).

Names of Witnesses	Relationship to the Incident	Where They Can Be Reached

Project Implications

What is the cost impact to the project (i.e., lost days, man-hours, equipment)?

What is the schedule impact to the project?

Does the incident impact the scope of the project in other ways? If so, how?

OGDEN

Distribution: Corporate Health and Safety Director, Divisional Health and Safety Manager or Project Health and Safety Manager, and Office HSC.

RECORD OF CHANGE
SITE-SPECIFIC HEALTH AND SAFETY PLAN

GENERAL SITE INFORMATION

SITE NAME:	**DATE:**
PROJECT NUMBER:	**SITE H&S COORDINATOR:**
PROJECT MANAGER:	**SITE MANAGER:**

DESCRIPTION OF AND JUSTIFICATION FOR CHANGE

SHSC SIGNATURE: ______________________ DATE: __________

AUTHORIZATION: ______________ TITLE: ____________ DATE: __________

OGDEN

DATE: ____________________
PROJECT #: ________________
SHSC: ___________________

SHSC BIWEEKLY SUMMARY

(for projects that take place over a period of more than two weeks)

SCOPE Briefly describe the range of work tasks being performed during this period

HSP COMPLIANCE Indicate and describe any HSP-related compliance issues

_______ Non-use or misuse of PPE in required areas.
_______ Violation of eating, smoking or chewing in prohibited areas.
_______ Are there any recommended change orders to the HSP?____________________________
_______ Other ____
____
____

INJURY/INCIDENTS/ILLNESSES Note any job-related first-aid, injury or illnesses during this period.

_______ Yes ____
_______ No
_______ Reports previously submitted

INSPECTIONS Indicate any inspections conducted during this period of:

_______ General site conditions
_______ Emergency equipment (first-aid kit, SCBAs, fire extinguishers, etc.)
_______ MSDSs on file for all chemicals and calibration gases brought/used onsite
_______ Current certification letter for all onsite (non-visitor) personnel
_______ Contractor(s) inspection/maintenance of respective onsite equipment
_______ Routine monitoring equipment maintenance
_______ Other ___________________________________

AIR SURVEILLANCE/EXPOSURE MONITORING

_______ Have action levels consistently been exceeded in any work zone?
_______ Do you recommend any changes to the action levels based on site conditions and/or analytical data?
_______ Were any TWA air samples collected this period?
_______ Are any/additional TWA sampling recommended?
_______ Is the heat stress monitoring program adequate?
_______ Have you received any complaints or concerns related to exposure?____________________
____

SUPPLIES/EQUIPMENT Are there any supplies, equipment and/or services that you would like procured? If yes, please indicate
shipping information (address).

GENERAL (Use reverse as necessary)

______________________________ ____________________
SHSC signature Date

Submit to the project manager and HSM or Project Health and Safety Manager and maintain in project files

OGDEN

APPENDIX 3
STANDARD OPERATING PROCEDURES FOR SITE ACTIVITIES

OGDEN ENVIRONMENTAL AND ENERGY SERVICES

STANDARD OPERATING PROCEDURE

S.O.P. NO. H-2 | PAGE 1 OF 14

EFFECTIVE DATE 2/18/97 | REVISION NO. 0

APPROVAL Denise L. Daggett, CIH

TLE **CARCINOGENS**

1.0 PURPOSE

In accordance with the Occupational Safety and Health Administration (OSHA) standards for carcinogens in the workplace, the purpose of this procedure is to provide guidelines to ensure the health and safety of personnel working in areas where the potential for incidental exposure to known carcinogens exists. The federal regulations are oriented towards industrial settings; however, there is also applicability in the environmental and hazardous waste job functions.

2.0 SCOPE

This procedure applies to all OEES employees and subcontractors whose work activities may include environmental assessments (Phase I or II Site Assessments) or hazardous waste site investigations (e.g., trenching, excavating, drilling, monitoring well installation, etc.) that could potentially involve exposure to carcinogens (e.g., arsenic [inorganic], benzene, beryllium, cadmium, formaldehyde, or vinyl chloride). Consult a Certified Industrial Hygienist (CIH) regarding regulatory applicability for specific projects.

3.0 DEFINITIONS

Action Level - A concentration of the contaminant, usually one-half of the permissible exposure limit (PEL), averaged over an 8-hour period.

AIHA-Accredited Laboratory - American Industrial Hygiene Association - accredited laboratory. Personal monitoring samples must be analyzed by an AIHA-accredited lab.

Carcinogen - A material that either causes cancer in humans or, because it causes cancer in experimental animals, is considered capable of causing cancer in humans.

Carcinogen Protection Plan - A written document specifying the analytes of concern, sampling method and media, number of samples and field blanks, OSHA limits, etc.

Contamination Reduction Zone - The Contamination Reduction Zone (CRZ) is defined as the area between the Transition Zone (TZ) and the Support/Clean Zone (SZ). Consisting of two separate decontamination lines, this is the area where both equipment and personnel are "cleaned" in order to prevent the spread of contamination. The CRZ should be marked as narrow corridors through which personnel and equipment pass from work zones to the SZ.

Decontamination - Decontamination is defined as the process of physically removing contaminants or changing their chemical nature to innocuous substances.

Employee Exposure - Exposure to airborne contaminants which can occur if an employee is not using respiratory equipment.

Exclusion/Hot Zone - The Exclusion/Hot Zone (EZ) is defined as the area where contamination is the greatest. It encompasses a 30-foot radius around intrusive activities with access restricted to field sampling crews and necessary equipment operators.

Immediately Dangerous to Life or Health (IDLH) - Conditions that pose an immediate threat to life or health (toxic, explosive, etc.) or conditions that pose an immediate threat of severe exposure to contaminants such as radioactive materials, which are likely to have an adverse cumulative or delayed effect on health. Also, the maximum concentration from which, in the event of respiratory equipment failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.

Permissible Exposure Limit (PEL) - An employee exposure to any substance listed in any part of 29 CFR 1910 or 29 CFR 1926 shall not exceed the 8-hour time-weighted Average (TWA) given for that substance in any 8-hour work shift of a 40-hour workweek. Where designated, ceiling values shall not be exceeded at any time.

Regulated Area - Any area where airborne concentrations of a contaminant exceed or can reasonably be expected to exceed, the established PEL.

Short-Term Exposure Limit (STEL) - A 15-minute TWA exposure which should not be exceeded at any time during a workday.

Support/Clean Zone - The Support/Clean Zone (SZ) is defined as the area of contamination. It is upwind and away from the EZ and serves as the location where vehicles, emergency equipment, telephones, break areas, and all nonessential personnel remain.

Time Weighted Average (TWA) - The average concentration for a conventional 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse affect.

Transition Zone - The Transition Zone (TZ) is defined as the area between the EZ and CRZ. It should be established upwind of the EZ and serve as the support area for sample quality assurance/quality control (QA/QC) and packing. Any coolers that are in this zone should be protected from contamination using polyethylene sheeting and decontaminated prior to leaving the site.

4.0 RESPONSIBILITIES

4.1 Certified Industrial Hygienist (CIH)

The CIH is responsible for determining the applicability of the federal or state OSHA and U.S. Environmental Protection Agency (USEPA) requirements and any local or client guidelines pertinent to exposure to suspected site carcinogens. This information is conveyed to the Site Health and Safety Coordinator (SHSC) for incorporation into the Carcinogen Protection Plan. The CIH also reviews and approves the Carcinogen Protection Plan generated by the SHSC. The Corporate Health and Safety Director (CHSD) is a CIH and some Health and Safety Managers (HSMs) are CIHs. Consult with the CHSD or the HSM for each assigned project with regard to carcinogen requirements.

4.2 SUPERVISOR/FIELD MANAGER (FM)

The Supervisor/FM is responsible for ensuring compliance with this procedure and ensuring personnel are trained in accordance with Section 6.0 of this Standard Operating Procedure (SOP). The Supervisor/FM is also responsible for determining the applicability of federal or state OSHA and USEPA requirements and any local guidelines pertinent to disposal of suspected carcinogen-contaminated media.

4.3 SHSC

The certified SHSC (see SOP A-5, *OEES Site Health and Safety Coordinator (SHSC) Certification Requirements Procedure*) is responsible for generating the site Carcinogen Protection Plan and implementing the procedures defined in it. SHSCs assigned to site work governed by this SOP shall be capable of Carcinogen Protection Plan preparation and applicable carcinogen standard interpretation. SHSCs shall be approved by the CIH.

4.4 EMPLOYEES

Employees are responsible for complying with all guidelines specified in this procedure.

5.0 PROCEDURE

5.1 RECOGNITION

Prior to work that involves potential exposure to known or suspected carcinogens, the potential exposure hazards must be identified. If determined to be necessary, air monitoring or personal sampling must be performed in accordance with the specific carcinogen OSHA regulation.

5.2 EVALUATION

Evaluation of work tasks that may involve potential exposure to carcinogens must be documented in the site-specific Health and Safety Plan (HSP) which contains a Carcinogen Protection Plan for the site.

5.3 CARCINOGEN PROTECTION PLAN

5.3.1 Compliance Program

A compliance program, in the form of an HSP containing a Carcinogen Protection Plan, shall be established and implemented to reduce exposures to or below the PEL by means of engineering and work practice controls. Written Carcinogen Protection Plans for these compliance programs shall include at least the following:

- a description of each operation in which potential carcinogens are emitted (e.g., field operations including trenching, excavation, drilling, monitoring well installation, ground-water sampling, etc.);
- a description of the specific means that will be employed to achieve compliance, including engineering controls and studies used to determine methods selected for controlling carcinogen exposures;
- a report of the technology considered in meeting the PEL;
- air monitoring data which documents the source of carcinogen emissions;
- a detailed schedule for implementation of the program, including documentation such as copies of purchase orders for equipment, construction contracts, personal protective equipment (PPE), etc.;
- a work practice program which includes items required under OSHA regulations (such as safe work practices; respiratory protection selection, use, and maintenance; respiratory program; protective work clothing and equipment; housekeeping; and hygiene facilities and practices);
- an administrative control schedule, if applicable;
- a discussion of applicable state OSHA and USEPA requirements and local guidelines pertinent to exposure; and

- other relevant information including analyte of concern, sampling method, sampling media, number of field samples and blanks, OSHA PELs, and site maps.

This written Carcinogen Protection Plan as part of the HSP shall be prepared by the SHSC and approved by a CIH and must be updated as stipulated in the HSP to reflect the current status of the compliance program.

5.3.2 Sampling and Analysis

Sampling and analysis for suspected site carcinogens shall be done by the SHSC in accordance with National Institute for Occupational Safety and Health (NIOSH)- or OSHA-approved methods. Samples shall be analyzed at an American Industrial Hygiene Association (AIHA)-accredited laboratory. Accuracy of results must be within the guidelines stated in the corresponding OSHA regulations for the suspected site carcinogen.

5.3.2.1 Record Keeping

The Carcinogen Protection Plan as part of the site-specific HSP must be maintained onsite at all times. In addition, Workplace Exposure Monitoring Records (Attachment 1), and sample chain-of-custody and analytical results must be made available to each employee and maintained in appropriate personnel files. Calibration is documented on the Workplace Exposure Monitoring Record as well as on the Instrument Calibration Log (Attachment 2).

5.3.2.2 Laboratory Selection

The analytical laboratory selected to analyze collected samples must be accredited by the AIHA. A list of accredited laboratories is furnished as Attachment 3. A current copy of this list may be obtained by calling the AIHA at (703) 849-8888.

Prior to choosing a laboratory, the SHSC should confirm that it is an AIHA-accredited laboratory and discuss the analytical aspects of the Carcinogen Protection Plan with a knowledgeable laboratory manager at the selected laboratory. Discussions with the laboratory manager should include a discussion of the best/accurate method of analysis.

5.3.3 Monitoring

5.3.3.1 Initial Determination

Initial determination of employee exposure will be based on monitoring results and the following:

- any information, observations, or calculations that would indicate employee exposure to carcinogens;

- any previous measurements of airborne carcinogens; and

- any employee complaints of symptoms which may by attributable to exposure to carcinogens.

When the SHSC or FM determines that there is the possibility of employee exposure at or above the action level of a suspected carcinogen, the SHSC must conduct personal monitoring which is representative of the exposure for each employee on the site who is exposed to the carcinogen.

If the initial monitoring reveals that employee exposure is above the action level for the suspected carcinogen but below the PEL, monitoring must be conducted in accordance with the guidelines set forth in Attachment 4, Table of Frequently Encountered Carcinogens. Monitoring shall continue at the required frequency until at least two consecutive measurements, taken at least seven days apart, are below the action level. At that time, monitoring may be discontinued unless there is reason to believe that the exposure may have changed.

If the initial monitoring reveals that employee exposure is above the PEL, monitoring must be conducted in accordance with the guidelines set forth in Attachment 4 until at least two consecutive measurements, taken at least seven days apart, are below the PEL and at or below the action level. At that time, monitoring shall be repeated as stated in the previous paragraph. Results of personal monitoring shall be disclosed in writing to employees within the time periods specified in Attachment 4.

On sites where any employee is exposed to a carcinogen above the PEL, the Supervisor/FM and SHSC must ensure that engineering and work practice controls (including administrative controls as specified in the site-specific HSP) are implemented to reduce employee exposure to site carcinogens. Whenever engineering and work practice controls are not feasible or are not sufficient to reduce the exposure to or below the PEL, such engineering and work practice controls shall nonetheless be used to reduce exposures to the lowest feasible levels and shall be supplemented by the use of respiratory protection and other PPE. Refer to the specific carcinogen OSHA regulation for guidance, selection, and use of respiratory protection.

5.3.3.2 Ventilation Systems

When mechanical ventilation is feasible for use to control exposure, measurements demonstrating the effectiveness of the system in controlling exposure, such as capture velocity, duct velocity, or static pressure, shall be made by a qualified SHSC and documented at least every three months. Measurements of the system's effectiveness in controlling exposure shall be made within five days of any production process change or control which might result in altering employee exposure to site carcinogens.

If air from exhaust ventilation is recirculated into the workplace, the SHSC shall assure that the system has the appropriate contaminant abatement control device (i.e., high-efficiency particulate air (HEPA) or organic vapor filter, as applicable), with a reliable backup device. In addition, it must have controls to monitor the concentrations of suspected carcinogens in the return air and to bypass the recirculation system automatically if it fails at any time.

5.3.4 Other Engineering Controls

In addition to ventilation systems, engineering controls likely to be used in field projects to reduce potential exposures include dust suppression by placement of tarps or plywood on heavily traveled areas and stockpiled soil and use of cyclones and watersprays in dust-producing operations such as excavations or in concrete and rock coring.

5.3.5 Decontamination

Work zones and restricted areas will be established in accordance with the site-specific HSP to prevent the spread of suspected site carcinogens into the adjacent clean work areas.

Personnel and equipment must be decontaminated prior to exiting the work area (EZ). Appropriate decontamination procedures, discussed in the site-specific HSP as well as in SOP H-5, *Sampling Equipment, Heavy Equipment, and Vehicle Decontamination*, and SOP H-6, *Personnel Decontamination*, will be followed.

5.3.6 Hygiene

Where workers are exposed to suspected site carcinogens above the PEL or to carcinogens that may cause skin or eye irritation, PPE shall be worn that prevents contamination of the worker and his/her garments. Examples of PPE include gloves, head protection (i.e., hard hats or hoods), disposable coveralls, boot covers, face shields, and vented goggles. PPE issuance, use, and maintenance will comply with SOP H-12, *Personal Protective Equipment*. Hazard Assessment and PPE Selection forms (see SOP H-12) will be used, as appropriate. The protective clothing shall be provided daily or more frequently, as necessary.

All protective clothing must be removed at the completion of a work shift in the CRZ. CRZs shall be clean and equipped with separate storage facilities for protective work clothing and equipment and for street clothes to prevent cross-contamination. When showers are provided for employees who are exposed to site carcinogens above the PEL, employees will not be allowed to leave the workplace wearing any clothing or equipment worn during the work shift.

Contaminated clothing which is to be disposed of shall be placed in a closed container in the CRZ which prevents dispersion of suspected site carcinogens outside the container and labeled as specified in the corresponding OSHA regulation for the suspected site carcinogen.

6.0 COMMUNICATION OF HAZARDS

OEES will communicate carcinogenic hazards by means of sign-posting, labels, Material Safety Data Sheets (MSDSs), and training.

6.1 SIGNS AND LABELS

OEES shall post signs and labels in accordance with Attachment 5, Table of Required Postings for Carcinogens. No statement shall appear on or near any required sign, label, or instruction which contradicts or detracts from the effect of any required warning, information, or instruction. The labels shall comply with SOP H-8, *Hazard Communication Written Program*.

6.2 MSDSs

Current MSDSs will be readily available for all carcinogens that are used by OEES employees in the workplace. MSDSs should arrive with any shipment of material that contains a carcinogen. If an MSDS is not provided by the manufacturer, importer, or distributor, the person receiving the shipment and using the material shall notify the SHSC immediately. Refer to SOP H-8, *Hazard Communication Written Program*, for additional information.

6.3 INFORMATION AND TRAINING

Any employee who has the potential to be exposed to carcinogens at or above the action level or who may be exposed to carcinogens that cause skin or eye irritation will receive training prior to the initial time of job assignment and annually thereafter.

A copy of this SOP and the corresponding OSHA standard from 29 CFR will be made available to any affected employee.

The outline for some specific carcinogens (i.e., inorganic arsenic, cadmium, vinyl chloride, and formaldehyde) exposure training is provided in the Training Program, Volume IV of this manual. In addition to this training, all employees on a hazardous waste site must have completed Hazardous Waste Operations and Emergency Response

(HAZWOPER) initial and annual refresher training per 29 CFR 1910.120 and 29 CFR 1926.65.

7.0 SPECIAL REQUIREMENTS

7.1 MEDICAL SURVEILLANCE

All employees who are or may be exposed above the action level of any carcinogen for more than 30 days per year must be included in the Medical Surveillance Program. In addition to the tests specified in the Medical Surveillance Program, Volume III of this manual, medical tests identified in the standards for each carcinogen are a detailed work and medical history and a medical examination which includes the following:

- Arsenic (inorganic) - a 14" by 17" posterior-anterior chest X-ray and International Labor Office UICC/Cincinnati (ILO U/C) rating, a nasal and skin examination, a sputum cytology examination, and other examinations which the physician believes appropriate because of the employee's exposure.

- Benzene - complete blood count including leukocyte count with differential, a quantitative thrombocyte count, hematocrit, hemoglobin, erythrocyte count, erythrocyte indices, and other examinations which the physician believes appropriate because of the employee's exposure.

- Beryllium - no medical surveillance guidelines given.

- Cadmium - micrograms of cadmium in urine, standardized to grams of creatinine; beta-2 microglobulin in urine, standardized to grams of creatinine, with pH specified; cadmium in blood, standardized to liters of whole blood; and other examinations which the physician believes appropriate because of the employee's exposure.

- Formaldehyde - physical exam with emphasis on evidence of irritation or sensitization of the skin and respiratory system, shortness of breath, or irritation of eyes and other examinations which the physician believes appropriate because of the employee's exposure.

- Vinyl Chloride - a general physical exam with specific attention to detecting enlargement of liver, spleen, or kidneys, or dysfunction in these organs, and for abnormalities in skin, connective tissues, and the pulmonary system; a serum specimen to determine total bilirubin, alkaline phosphatase, serum glutamic oxalacetic transaminase, serum glutamic pyruvic transaminase, and gamma glustamyl transpeptidase; and other examinations which the physician believes appropriate because of the employee's exposure.

Within five working days after receipt of the monitoring results, the SHSC shall notify each employee in writing of the results which represent that employee's exposure.

7.2 EMERGENCY SITUATIONS

In the event of an injury or illness resulting from exposure to suspected site carcinogens, the following steps as outlined in the site-specific HSP will be taken:

- Sound the emergency alarm to summon the FM and SHSC.
- Decontaminate and move the injured or ill employee to an uncontaminated area.
- Have the FM and SHSC determine whether medical treatment is necessary. If it is, either transport the employee to the designated hospital or call for an ambulance.
- If medical treatment is sought, the hazard must be disclosed to emergency medical personnel.

Once the injured or ill employee is taken care of, the SHSC will contact the HSM, conduct an investigation jointly with the FM, and complete the Supervisor's Report of Injury or Illness form (Attachment 6), the First-aid Incident Report (Attachment 7), and the Accident/First-aid Incident Summary Log (Attachment 8). These forms must be transmitted to the HSM within 24 hours of an occurrence.

For additional information on emergency situations and procedures, refer to SOP A-1, *Accident Investigation*; SOP A-3, *Injury or Illness Reporting*; SOP ER-1, *Bloodborne*

Pathogen Exposure Control Plan for Field Operations; and SOP ER-2, *Emergency Action Plan for Field Operations.*

7.3 RESPIRATOR FIT-TESTS

Employees who conduct work where the possibility for exposure to carcinogens exists or who are present in areas requiring the use of a respirator for protection against exposure to suspected site carcinogens must be medically cleared and fit-tested to wear a respirator. Qualitative fit-tests may be used only for testing the fit of half-face air-purifying respirators where their use is permitted by the specific OSHA carcinogen standard. Quantitative fit-tests will be used for testing the fit of full-face air-purifying respirators when required by the specific carcinogen standard. Fit-testing will be performed in accordance with the applicable standard. See also SOP H-13, *Respiratory Protection Program.*

8.0 RECORDS

Training records shall be recorded and maintained in the employee records. A detailed training outline and references used to conduct the specific carcinogen training shall be included with the Record of Meeting form (Attachment 9). Employees, contractors, and subcontractors must be able to produce current applicable training certificates upon request. Current records of personal air sampling, air monitoring logs, exposure disclosures, medical clearances and/or restrictions, and respirator fit shall also be maintained in the employee records by the Health and Safety Coordinator (HSC) for the home office location of the affected employee.

9.0 REFERENCES

Fed-OSHA. 1995. 29 CFR 1910.120, *Hazardous Waste Operations and Emergency* Response.

Fed-OSHA. 1995. 29 CFR 1910.1000, *Air Contaminants.*

Fed-OSHA. 1995. 29 CFR 1910.1017, *Vinyl Chloride.*

Fed-OSHA. 1995. 29 CFR 1910.1018, *Inorganic Arsenic.*

Fed-OSHA. 1995. 29 CFR 1910.1027, *Cadmium.*

Fed-OSHA. 1995. 29 CFR 1910.1028, *Benzene.*

Fed-OSHA. 1995. 29 CFR 1910.1048, *Formaldehyde.*

Fed-OSHA. 1995. 29 CFR 1910.1200, *Hazard Communication.*

American Conference of Governmental Industrial Hygienists (ACGIH). 1996. *Threshold Limit Values (TLVs™) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs™).*

U. S. Department of Health and Human Services. 1994. NIOSH *Pocket Guide to Chemical Hazards*. June.

Genium Publishing Corporation. 1991. The MSDS Pocket Dictionary.

10.0 ATTACHMENTS

1. Workplace Exposure Monitoring Record
2. Instrument Calibration Log
3. List of AIHA-accredited Laboratories
4. Table of Frequently Encountered Carcinogens
5. Table of Required Postings for Carcinogens
6. Supervisor's Report of Injury or Illness
7. First-aid Incident Report
8. Accident/First-aid Incident Summary Log
9. Record of Meeting Form

ATTACHMENT 1

WORKPLACE EXPOSURE MONITORING RECORD

WORKPLACE EXPOSURE MONITORING RECORD

Name ______________________________

Social Security Number ______________________________

Employer/Officer ______________________________

Job Function ______________________________

Project No. ______________________________

Project Name ______________________________

Project Dates ______________________________

Project Location ______________________________

SAMPLING METHOD

- ☐ Adsorber ______________________________
- ☐ Detector Tube ______________________________
- ☐ Dosimeter Badge ______________________________
- ☐ Filter ______________________________
- ☐ Impinger ______________________________
- ☐ Meter ______________________________
- ☐ Other ______________________________

SAMPLE TYPE

- ☐ Area
- ☐ Background
- ☐ Biological
- ☐ Personal

WORK ZONE

- ☐ Contamination Reduction
- ☐ Exclusion
- ☐ Support
- ☐ Other ______________________________

SAMPLE COLLECTION

Sample No. ______________________________

Instrument Make/Model ______________________________

Calibration Date ______________________________

Sample Date ______________________________

Collected By ______________________________

Analyzed By ______________________________

(Use reverse side for calculation and sketches as necessary.)

Sample Duration ______________________________ (min.)

Sample Rate ______________________________ (ml/min.)

Sample Volume ______________________________ (L)

ATMOSPHERIC CONDITIONS

Humidity (%)
- ☐ Low 0-30
- ☐ Med 30-70
- ☐ High 70-100

Wind (mph)
- ☐ Light 0-5
- ☐ Moderate 5-20
- ☐ High >20

Temperature ____________ °F

Direction ____________

ANALYTICAL RESULTS

Contaminant	OSHA PEL (TWA)	Concentration (Total)	Concentration (TWA)	Analytical Method	Detection Limit (Method)

PPE WORN (✓ = Yes)

- ☐ Half-Face Purifying Respirator
- ☐ Full-Face Purifying Respirator
- ☐ Air-Supplied Respirator
- ☐ Disposable Respirator
- ☐ Chemical Cartridge
- ☐ HEPA Cartridge
- ☐ Disposable Coverall
- ☐ Chemical Gloves
- ☐ Chemical Boots
- ☐ Slicker
- ☐ Unknown
- ☐ Safety Glasses
- ☐ Goggles
- ☐ Hearing Protection
- ☐ Other ______________________________

____

____

OTHER REPRESENTATIVE PERSONNEL

______________________________ ______________________________

______________________________ ______________________________

______________________________ ______________________________

GENERAL COMMENTS

____

____

____

OGDEN

Distribution: H & S Personnel File, Project File, Employee, Other

ATTACHMENT 2

INSTRUMENT CALIBRATION LOG

INSTRUMENT CALIBRATION LOG

JOB NUMBER: ______________ PROJECT: ______________ LOCATION: ______________

DATE/TIME	INSTRUMENT	SERIAL NUMBER	SPAN GAS SUBSTANCE	SPAN CONC.	INSTRUMENT READING AT CALIBRATION	INSTRUMENT CALIBRATION READING POST SAMPLING	COMMENTS

OGDEN

ATTACHMENT 3

LIST OF AIHA-ACCREDITED LABORATORIES

AIHA
The Essential Source

The American Industrial Hygiene Association
IH Accredited Laboratories

Proficiency testing is an integral part of the AIHA's Industrial Hygiene Laboratory Accreditation Program, and is fulfilled by the laboratory's participation in the AIHA Proficiency Analytical Testing (PAT) Program. This program presently includes quarterly samples for metals (three of the following are sent on a rotating basis: lead, cadmium, zinc, and chromium), asbestos and other fibers, silica, and organic solvents (three of the following solvents are provided on a rotating basis: carbon tetrachloride, benzene, methanol on silical gel, cellosolve acetate, trichloroethylene, p-dioxane, toluene, chloroform, 1,2-dichloroethane, methylene chloride, methyl chloroform, o-xylene, and tetrachloroethylene). Accredited laboratories are required to analyze all materials in the PAT Program that they analyze as a part of their routine laboratory operations. Users should check with individual laboratories for the proficiency status of the current round (#126).

M—Metals
S—Silica
A—Asbestos and other fibers
O—Organic Solvents
X—Laboratory does not analyze that analyte class

To make it easier to locate a laboratory or laboratories in a particular area, listings are broken down geographically by state and alphabetically within each state. To find the listing of a laboratory where the name but not the location is known, refer to the alphabetical cross-reference at the end of the geographical listing. Those laboratories marked with a ▲ accept samples on a fee basis.

The following laboratories (335 total) have been accredited under the Industrial Hygiene Laboratory Accreditation Program of the American Industrial Hygiene Association as of **November 1, 1996**.

ALABAMA

Monsanto Chemical Company
P.O. Box 2204
Decatur, AL 35609-2204
(205)552-2886
MXXO PAT ID 9208

Monsanto Company-Anniston Plant
300 Birmingham Highway
Anniston, AL 36201
(205)231-8406
XXXO PAT ID 9218

Reynolds Metals Company
3326 East Second Street
Muscle Shoals, AL 35661-1258
(205)386-9611
MXXO PAT ID 9212

▲ Roy F. Weston, Inc.
Auburn Alabama Laboratory
1635 Pumphrey Avenue
Auburn, AL 36830
(334)826-6100
MXAO PAT ID 9224

▲ Safety Environmental Laboratories, Inc.
3033 Loma Road
P.O. Box 661076
Birmingham, AL 35266-1076
(205)823-6200
MXAX PAT ID 9200

Southern Research Institute
Industrial Hygiene Laboratory
PO Box 55305, 2000 Ninth Ave S.
Birmingham, AL 35255-5305
(205)581-2704
MXXO PAT ID 9202

▲ Technical Micronics Control, Inc.
210 Wynn Drive, N.W.
Huntsville, AL 35805
(205)837-4430
MXXX PAT ID 11882

ARKANSAS

▲ American Interplex Corporation
8600 Kanis Road
Little Rock, AR 72204-2322
(501)224-5060
MXXO PAT ID 10504

▲ EEG, Inc.
1305 East Main
Russellville, AR 72801
(501)968-6767
MXAX PAT ID 10513

ARIZONA

Arizona Dept. of Health Services
State Laboratory Services
1520 West Adams Street
Phoenix, AZ 85007-2698
(602)542-1188
MXXO PAT ID 10860

ARIZONA (con't)

Environmental Management Consultants
4455 East Camelback Road
Suite B-155
Phoenix, AZ 85018
(602)840-8012
XXAX PAT ID 10863

▲ **Fiberquant Analytical Services**
5025 S. 33rd Street
Phoenix, AZ 85040
602-276-6139
MXAX PAT ID 10873

CALIFORNIA

▲ **Aerojet Analytical Laboratories**
Bldg. 02030
P.O.Box 15847
Sacramento, CA 95852-1847
(916)355-4051
MXAO PAT ID 11354

▲ **American Environmental Network, Inc.**
3440 Vincent Road
Pleasant Hill, CA 94523
(510)930-9090
MXXO PAT ID 11134

▲ **Assay Technology, Inc.**
1070 East Meadow Circle
Palo Alto, CA 94303
(415)424-9944
XXXO PAT ID 11124

▲ **CTL Environmental Services**
24416 S. Main St., Ste. 308
Laboratory Division
Carson, CA 90745
(310)549-6636
MXAO PAT ID 10967

California Dept. of Health Services
Env. Health Laboratory Branch
2151 Berkeley Way, Rm. 334
Berkeley, CA 94704
(510)540-2469
MXAO PAT ID 11154

▲ **Clayton Environmental Consultants, Inc.**
1252 Quarry Lane, IH Lab
P.O. Box 9019
Pleasanton, CA 94566
(510)426-2600
MXAO PAT ID 11142

▲ **Design for Health**
1516 West Redwood
Suite 104
San Diego, CA 92101
(619)291-1777
XXAX PAT ID 11054

▲ **EMS Laboratories, Inc.**
117 West Bellevue Drive
Pasadena, CA 91105-2503
(818)568-4065
MSAO PAT ID 10963

▲ **Forensic Analytical**
2959 Pacific Commerce Dr.
Rancho Dominguez, CA 90221
(310)763-2374
XXAX PAT ID 10957

▲ **Forensic Analytical Specialties, Inc.**
3777 Depot Road
Suite 409
Hayward, CA 94545
(510)887-8828
MXAX PAT ID 11143

▲ **Health Science Associates**
Industrial Hygiene Laboratory
10771 Noel Street
Los Alamitos, CA 90720-2547
(714)220-3922
MSAO PAT ID 10985

▲ **Hygeia Environmental Laboratories, Inc.**
ATC Environmental, Inc. DBA
82 West Sierra Madre Boulevard
Sierra Madre, CA 91024-2434
(818)355-4711
XXAX PAT ID 10995

IBM Corporation
Industrial Hygiene Lab
5600 Cottle Rd, Dept DNN
Bldg. 43B
San Jose, CA 95193
(408)256-5507
MXXO PAT ID 11176

▲ **ITEK Enviro Services, Inc.**
383 E. Grand Avenue, Suite E
South San Francisco, CA
94080-6209
(415)952-8501
MSAO PAT ID 11103

▲ **Kellco Services, Inc.**
44814 Osgood Road
Fremont, CA 94539
(510)659-9751
MXAX PAT ID 11109

Lawrence Livermore National Laboratory
Hazards Control Analytical Lab.
P.O. Box 808 L-383
Livermore, CA 94550
(510)423-7348
MXAO PAT ID 11138

▲ **Micro Analytical Laboratories, Inc.**
5900 Hollis St., Suite M
Emeryville, CA 94608-2008
(510)653-0824
MXAX PAT ID 11150

Navy Env. & Preventive Medicine Unit Five
Consolidated IH Laboratory
Bldg.14, NAS North Island
San Diego, CA 92135-7046
(619)545-4296
MXAO PAT ID 11051

Performance Analytical, Inc.
20954 Osborne Street
Canoga Park, CA 91304
(818)709-1139
XXXO PAT ID 11002

▲ **RJ Lee Group**
Bay Area Laboratory
530 McCormick Place
San Leandro, CA 94577
(510)567-0480
XXAX PAT ID 11157

▲ **SCA Environmental, Inc.**
Industrial Hygiene Laboratory
2114 Berkeley Way
Berkeley, CA 94704
(510)848-0389
XXAX PAT ID 11106

SRI International
Industrial Hyg. Chemistry Dept.
333 Ravenswood Avenue, PS 177
Menlo Park, CA 94025-3493
(415)859-6177
MSAO PAT ID 11104

State Compensation Insurance Fund
Wm. Armstrong Ind. Hygiene Lab.
1275 Market Street, Room 630
San Francisco, CA 94103-1410
(415)565-1725
XXAX PAT ID 11115

▲ **Truesdail Laboratories, Inc.**
14201 Franklin Avenue
Tustin, CA 92680
(714)730-6239
MXAO PAT ID 11072

CALIFORNIA (con't)

▲ **West Coast Analytical Service**
Industrial Hygiene Laboratory
9840 Alburtis Avenue
Santa Fe Springs, CA 90670-5850
(310)948-2225
MXXO PAT ID 10981

Zeneca Ag Products
Western Research Center
1200 South 47th St.,Box 4023
Richmond, CA 94804-0023
(510)231-1000
XXXO PAT ID 11162

COLORADO

▲ **ATC Environmental, Inc.**
5031 S. Ulster St., Ste. 100
Denver, CO 80237
(303)793-9939
XXAX PAT ID 10771

▲ **DCM Science Laboratory**
12477 West Cedar Drive
Lakewood, CO 80228-2012
(303)985-1155
MSAX PAT ID 10758

▲ **FRS Geotech, Inc.**
1441 W. 46th Ave., Ste. 14
Denver, CO 80211-2338
(303)477-2559
XXAX PAT ID 10794

▲ **Reservoirs Environmental Services, Inc.**
1827 Grant Street
Denver, CO 80203-1107
(303)830-1986
MXAO PAT ID 10768

▲ **Schuller International**
MTC IH Analytical Laboratory
P.O. Box 625005
Littleton, CO 80162-5005
(303)978-2584
MSAO PAT ID 10772

USACHPPM - DSA-WEST
FAMC Bldg. 602, 2nd Floor
Aurora, CO 80045-5001
(303)361-8288
MXXO PAT ID 10760

WASTREN - Grand Junction
2597 B 3/4 Road
Grand Junction, CO 81503
(970)248-6166
MSAX PAT ID 10808

CONNECTICUT

▲ **Baron Consulting Company, Inc.**
273 Pepe's Farm Rd.
Milford, CT 06460
(203)874-5678
MXXO PAT ID 6951

▲ **ChemScope, Inc.**
15 Moulthrop Street
North Haven, CT 06473-3633
(203)865-5605
MXAX PAT ID 6952

▲ **Connecticut Dept. of Health Services**
Lab. Div., P.O. Box 1689
10 Clinton Street
Hartford, CT 06101
(203)566-5626
MSAO PAT ID 6935

▲ **EnviroMed Services, Inc.**
25 Science Park
New Haven, CT 06511
(203)786-5580
MXAX PAT ID 6938

▲ **Environmental Health Laboratory**
CIGNA Loss Control Svcs., Inc.
100 Sebethe Dr., Suite 5-A
Cromwell, CT 06416
(860)635-6475
MSAO PAT ID 6945

▲ **HYGENIX, Inc.**
40 Hoyt Street
Stamford, CT 06905
(203)324-2222
XXAX PAT ID 6963

▲ **ITT Hartford Insurance Group**
Industrial Hygiene Laboratory
Hartford Plaza
Hartford, CT 06115
(860)547-4557
MSAO PAT ID 6942

▲ **Mystic Air Quality Consultants**
1204 North Road
Route 117
Groton, CT 06340
(800)247-7746
XXAX PAT ID 6947

▲ **Olin Environmental Hygiene Laboratory**
91 Shelton Avenue
New Haven, CT 06511
(203)495-8550
MSAO PAT ID 6955

TRC Environmental Corporation
Industrial Hygiene Laboratory
5 Waterside Crossing
Windsor, CT 06095
(860)298-6326
XXAO PAT ID 6940

▲ **The Travelers Indemnity Company**
248 Constitution Plaza
Tower Square
Hartford, CT 06103-1800
(800)842-0355
MSAO PAT ID 6944

DELAWARE

▲ **Batta Laboratories, Inc.**
Delaware Industrial Park
6 Garfield Way
Newark, DE 19713-5817
(302)737-3376
MXAO PAT ID 8737

E.I. du Pont de Nemours & Company
Haskell Lab for Toxicology & IH
Elkton Road, P.O. Box 50
Newark, DE 19714
(302)366-5285
XXAX PAT ID 8736

▲ **Environmental Testing, Inc.**
100 South Cass Street
P.O. Box 138
Middletown, DE 19709-0138
(302)378-9881
XXAX PAT ID 8734

FLORIDA

▲ **Advanced Chemical Sensors**
3201 North Dixie Hwy.
Boca Raton, FL 33431
(407)338-3116
XXXO PAT ID 11873

▲ **American Environmental Network**
11 East Olive Road
Pensacola, FL 32571
(904)474-1001
MXAX PAT ID 9133

▲ **Environmental Science & Engineering, Inc.**
P.O. Box 1703
Gainesville, FL 32602-1703
(352)332-3318
MXXO PAT ID 9135

FLORIDA (con't)

▲ **Law Engineering and Environmental Services**
5845 NW 158th St.
Miami Lakes, FL 33014
(305)826-5588
XXAX PAT ID 9159

Monsanto Company
Industrial Hygiene Laboratory
P.O. Box 97, Bldg. 707
Gonzalez, FL 32560-0097
(904)968-8486
MXXO PAT ID 9134

▲ **Post, Buckley, Schuh & Jernigan, Inc.**
Consulting Engineers & Planners
6635 East Colonial Drive
Orlando, FL 32807
(407)277-4443
MXXO PAT ID 9138

GEORGIA

▲ **Analytical Environmental Services, Inc.**
3781 Presidential Parkway
Suite 111
Atlanta, GA 30340
(770)457-8177
MXAX PAT ID 9096

▲ **Cape Environmental Management, Inc.**
2302 Parklake Dr., Ste. 200
Atlanta, GA 30345
(770)908-7200
XXAX PAT ID 9100

▲ **Clayton Environmental Consultants**
400 Chastain Center Blvd., NW
Suite 490
Kennesaw, GA 30144
(770)499-7500
XXAX PAT ID 9074

▲ **Environmental Health Laboratory**
P.O. Box 9093
3920 Arkwright Road
Macon, GA 31213-5799
(912)471-4544
MSAO PAT ID 9107

U.S.A.CHPPM DSA - S
Laboratory Division
Bldg. 180
Fort McPherson, GA 30330-5000
(404)752-3236
MXXO PAT ID 9092

HAWAII

Consolidated Industrial Hygiene Lab.
Navy Env. & Prev. Medicine Unit 6
P.O. Box 112, Building 1750
Pearl Harbor, HI 96860-5040
(808)474-4428
MSAO PAT ID 11495

▲ **Muranaka Environmental Consultants, Inc.**
801 Moowaa St.
Honolulu, HI 96817
(808)848-8866
XXAX PAT ID 11487

IDAHO

▲ **INEL Industrial Hygiene Laboratory**
P.O. Box 1625
Idaho Falls, ID 83415-4129
(208)526-2510
MXAO PAT ID 10827

ILLINOIS

Abbott Laboratories
Corporate IH Laboratory
1401 Sheridan Rd. D-38A, M2B
North Chicago, IL 60064
(708)937-2928
XXXO PAT ID 10232

Acme Steel Company
Environmental Services Lab
13500 South Perry Avenue
Riverdale, IL 60627-1182
(708)849-2500
MXXO PAT ID 10277

▲ **Aires Consulting Group, Inc.**
1550 Hubbard St.
Batavia, IL 60510
(630)879-3006
MXAO PAT ID 10239

▲ **American Foundrymen's Society, Inc.**
Lester B. Knight Env. Services Lab
505 State Street
Des Plaines, IL 60016-8399
(800) 537-4237
MSXX PAT ID 10221

Amoco Corporation
Amoco Research Center, F-3 EHS
P.O. Box 3011
Naperville, IL 60566
(630)420-5869
MXXO PAT ID 10266

Argonne National Laboratory
IH Laboratory, ESH - 200/F105
9700 South Cass Ave.
Argonne, IL 60439-4831
(708)252-7637
MXAO PAT ID 10253

▲ **Carnow, Conibear & Associates, Ltd.**
333 West Wacker Dr., Ste. 1400
Chicago, IL 60606-1265
(312)782-4486
XXAX PAT ID 10269

ComEd, CTEAM-SMAD
System Materials Analysis
555 Joliet Road
Bolingbrook, IL 60440
(708)783-3650
MXAX PAT ID 10242

▲ **Div.of Fed. Occup. Health Env.Laboratory**
536 South Clark St., Rm. 714
Chicago, IL 60605-1521
(312)886-0413
MXXO PAT ID 19902

▲ **JMS Environmental Associates, Ltd.**
816 Burr Oak Drive
Westmont, IL 60559
(708)655-8500
XXAX PAT ID 10264

▲ **Keter Consultants, Inc.**
8270 South Archer Avenue
Willow Springs, IL 60480
(708)839-1338
XXAX PAT ID 10250

Monsanto Company , W.G. Krummrich Plant
Industrial Hygiene Laboratory
500 Monsanto Ave.
Sauget, IL 62206-1198
(618)482-6528
XXXO PAT ID 10307

▲ **NATLSCO, a KRMS Company**
Route 22 and Kemper Dr. K-2
Long Grove, IL 60049-0075
(847)320-2488
MSAO PAT ID 10227

▲ **Northbrook Environmental Sciences Laboratory**
51 West Higgins Road
South Barrington, IL 60010
(847)551-2316
MXAO PAT ID 10190

ILLINOIS (con't)

▲ **United Analytical Services**
4413 W. Roosevelt Rd., Ste. 108
Hillside, IL 60162
(708)449-0070
XXAX PAT ID 10302

INDIANA

▲ **Atec Associates, Inc.**
Chemistry Department
5150 East 65th Street
Indianapolis, IN 46220
(317)849-4990
MXAO PAT ID 9398

▲ **Ball Corporation, Chemistry Laboratory**
P.O. Box 5000
Muncie, IN 47307
(317)747-6586
MXXO PAT ID 9447

▲ **Micro Air, Inc.**
7132 Lakeview Parkway West Dr.
Indianapolis, IN 46268
(317)293-1533
XXAX PAT ID 9403

IOWA

Monsanto Industrial Hygiene Laboratory
RR #5, P.O. Box 473
Muscatine, IA 52761
(319)262-7477
XXXO PAT ID 10047

▲ **NET, Inc.**
Cedar Falls Division
704 Enterprise Drive
Cedar Falls, IA 50613
(319)277-2401
MXAO PAT ID 10013

▲ **University of Iowa**
Univ. State Hygienic Laboratory
900 East Grand Ave.
Des Moines, IA 50319
(515)281-5371
MSXX PAT ID 10033

▲ **University of Iowa**
Univ. State Hygienic Laboratory
102 Oakdale Campus, H101 OH
Iowa City, IA 52242-5002
(319)335-4500
XXAO PAT ID 18260

KANSAS

▲ **Certified Environmental Management**
P. O. Box 504
Salina, KS 67402
(913)823-0492
MSAO PAT ID 10411

▲ **Professional Service Industries, Inc.**
4820 West 15th St.
Lawrence, KS 66049-3846
(913)749-2381
MXAO PAT ID 10391

▲ **Vulcan Chemicals**
Ind. Hygiene Lab. R/D Building
P.O. Box 12283
Wichita, KS 67277
(316)529-7396
MXXO PAT ID 10407

KENTUCKY

▲ **Analytical Management, Inc.**
2285 Executive Dr., Ste. 200
Lexington, KY 40505
(606)299-7775
XXAX PAT ID 9294

▲ **Guardian Laboratories LLC**
6309 Fern Valley Pass
Louisville, KY 40228
(502)964-0865
MXAO PAT ID 9271

Kentucky Cabinet for Health Services
Division of Laboratory Services
100 Sower Blvd., Ste. 204
Frankfort, KY 40601-8272
(502)564-4446
MXAO PAT ID 9285

Paducah Gaseous Diffusion Plant
Analytical Lab Dept/TSD,C-710 Bldg.
P.O. Box 1410, Hobbs Road
Paducah, KY 42001-1410
(502)441-6455
MXAX PAT ID 9291

LOUISIANA

▲ **American Analytical & Technical Services**
11950 Industriplex Blvd.
Baton Rouge, LA 70809
(504)753-8650
MXXO PAT ID 10477

▲ **Entek Environmental Laboratories, Inc.**
14285 Airline Highway
Baton Rouge, LA 70817
(504)752-2900
MXXO PAT ID 10480

▲ **Inchcape Testing Services**
Environmental Laboratories
7979 G.S.R.I. Avenue
Baton Rouge, LA 70820
(504)769-4900
MXAO PAT ID 10478

Monsanto Company
Luling Plant Laboratory
P.O. Box 174 (River Road)
Luling, LA 70070
(504)785-3334
XXXO PAT ID 10447

MAINE

▲ **Northeast Test Consultants**
587 Spring Street
Westbrook, ME 04092
(207)854-3939
XXAX PAT ID 6912

MARYLAND

▲ **AMA Analytical Services, Inc.**
4485 Forbes Boulevard
Lanham, MD 20706
(301)459-2640
XXAX PAT ID 8863

▲ **Apex Environmental, Inc.**
15850 Crabbs Branch Way
Suite 200
Rockville, MD 20855
(301)417-0200
XXAX PAT ID 8844

FMC Corporation
Industrial Hygiene Laboratory
1701 E. Patapsco Avenue
Baltimore, MD 21226
(410)354-5004
XXXO PAT ID 8877

▲ **Gascoyne Laboratories**
2101 Van Deman Street
Baltimore, MD 21224-6697
(410)633-1800
MXXX PAT ID 8885

▲ **IH Services, Inc.**
1831 Portal St., Ste. E
Baltimore, MD 21224
(410)633-4000
XXAX PAT ID 8886

MARYLAND (con't)

▲ **ManTech Environmental Corporation**
1901 Research Blvd., Ste. 240
Rockville, MD 20850
(301)419-7804
XXAX PAT ID 8849

Maryland Dept of Health & Mental Hygiene
Lab Admin-Occup Health Lab
201 West Preston Street
Baltimore, MD 21201
(410)767-5646
MXAO PAT ID 8876

▲ **Oneil M. Banks, Inc.**
Industrial Hygiene Laboratory
336 South Main Street
Bel Air, MD 21014
(410)879-4676
XXAX PAT ID 8860

▲ **Tracor Applied Sciences, Inc.**
Energy and Env. Services Division
1601 Research Boulevard
Rockville, MD 20850
(301) 838-6296
MXXO PAT ID 8848

US Army Center for Health Prom. & Prev. Med.
Directorate of Lab. Sciences
MCHB-OL-LO Bldg. E2100
APG - EA, MD 21010-5422
(410)671-4465
MXAO PAT ID 8858

MASSACHUSETTS

Commonwealth of Massachusetts
Dept. of Labor and Industries
1001 Watertown Street
West Newton, MA 02165-2148
(617)969-7177
MXAO PAT ID 6871

▲ **Con-Test Analytical**
39 Spruce St., 2nd Floor
Second Floor
East Longmeadow, MA
01028-2821
(413)525-2332
MXXO PAT ID 6838

Duracell, Inc.
Environmental & IH Laboratory
37 A Street
Needham, MA 02194-2875
(617)449-7600
MXXO PAT ID 6858

▲ **ESA Laboratories, Inc.**
IH Analytical Laboratory
22 Alpha Road
Chelmsford, MA 01824-4171
(508)250-7150
MXXO PAT ID 6851

▲ **Hygeia ProScience Laboratories, Inc.**
Industrial Hygiene Laboratory
600 W. Cummings Park, Suite 1900
Woburn, MA 01801-6350
(617)938-1084
MXAO PAT ID 6855

▲ **IEA - MA, Inc.**
149 Rangeway Road
N. Billerica, MA 01862
(508)667-1400
MXAO PAT ID 6859

▲ **Liberty Mutual Insurance Co.**
Industrial Hygiene Laboratory
71 Frankland Road
Hopkinton, MA 01748
(800)230-6263
MSAO PAT ID 6852

▲ **MIT Industrial Hygiene Lab**
Building 20C-204
77 Massachusetts Ave.
Cambridge, MA 02139-4307
(617)253-2596
MXAO PAT ID 6876

▲ **Tundra Air Consultants**
300 Wildwood Avenue
Woburn, MA 01801
(617)933-2555
XXAX PAT ID 6883

MICHIGAN

▲ **AAC Trinity, Inc.**
38855 Hills Tech Dr., Ste. 550
Farmington Hills, MI 48335
(810)848-9656
MSAO PAT ID 9524

BASF Corporation
Research Services Environmental
1419 Biddle Avenue
Wyandotte, MI 48192
(313)246-6237
XXXO PAT ID 9565

▲ **Clayton Environmental Consultants, Inc.**
22345 Roethel Drive
Novi, MI 48375
(810)344-2652
MSAO PAT ID 9532

▲ **Corrosion Control Consultants & Labs, Inc.**
4403 Donker Ct., SE
Kentwood, MI 49512-4054
(616)940-3112
MXXX PAT ID 9636

▲ **CzarTech Analytical, Inc.**
42910 West Ten Mile Road
Complex A-6
Novi, MI 48375
(810)348-2300
XXXO PAT ID 9580

Dow Chemical Company
Ind. Hygiene Laboratory
1803 Building
Midland, MI 48674
(517)636-0629
XXXO PAT ID 9583

Dow Corning Corporation
3901 Saginaaw Road, Mail #115
Midland, MI 48686-0995
(517)496-5680
XXXO PAT ID 9582

Ford Motor Company
Industrial Hygiene Laboratory
15000 Century Drive, Room 104
Dearborn, MI 48120
(313)594-6955
MXAO PAT ID 9560

Michigan Dept. of Consumer & Industry Serv.
Occupational Health Laboratory
P.O. Box 30035
Lansing, MI 48909
(517)335-8243
MSAO PAT ID 9590

Pharmacia & Upjohn Inc.
IH Lab, Unit 6604-41-016
7000 Portage Road
Kalamazoo, MI 49001-0199
(616)833-6530
XXXO PAT ID 9592

MINNESOTA

3M Company
Industrial Hygiene Services
Bldg. 220-2E-02 3M Center
St. Paul, MN 55144-1000
(612)733-0024
XXXO PAT ID 10101

▲ **3M Environmental Laboratory**
935 Bush Ave.
P.O. Box 33331
St. Paul, MN 55133-3331
(612)778-6479
MXXO PAT ID 14857

MINNESOTA (con't)

▲ **Applied Environmental Sciences, Inc.**
5075 Wayzata Blvd., Ste. 285
Minneapolis, MN 55416-1327
(612)942-4814
XXAX PAT ID 10107

▲ **Braun Intertec Corporation**
P.O. Box 39108
6875 Washington Avenue South
Minneapolis, MN 55439-0108
(612)942-4849
MXAO PAT ID 10109

▲ **IBM Corporation**
Materials and Process Eng. Lab.
3605 Highway 52 N., Dept 5E3
Rochester, MN 55901-7829
(507)253-5279
MXXO PAT ID 10115

▲ **Institute for Environmental Assessment**
7101 Northland Cir., Ste. 219
Brooklyn Park, MN 55428-1517
(612)535-7721
XXAX PAT ID 10102

▲ **Nova Environmental Services, Inc.**
Hazeltine Gates, Suite 400
1107 Hazeltine Blvd.
Chaska, MN 55318
(612)448-9393
XXAX PAT ID 10104

MISSOURI

Bayer Corporation
Agriculture Div., Mfg. Dept.
P.O. Box 4913, 8400 Hawthorn
Kansas City, MO 64120-0013
(816)242-2498
XXXO PAT ID 10367

Central Region Environmental Laboratory
#1 Jefferson Barracks Drive
(132/ASB)
St. Louis, MO 63125
(314)845-5003
XXAX PAT ID 10338

▲ **Industrial Testing Laboratories**
2350 South 7th Street
St. Louis, MO 63104-4296
(314)771-7111
MXAO PAT ID 10326

McDonnell Douglas Corporation
Analytical Chemistry Laboratory
MC 1022152, P.O. Box 516
St. Louis, MO 63166
(314)234-9824
MXXO PAT ID 10340

▲ **Microscopic Analysis, Inc.**
941 Gardenview Office Pky.
St. Louis, MO 63141
(314)993-2212
XXAX PAT ID 10342

Monsanto Company
Industrial Hygiene Laboratory
800 North Lindbergh Blvd.
St. Louis, MO 63167
(314)694-4838
XXXO PAT ID 10345

▲ **Specialized Scientific Services, LLC**
Twin Oaks, North Lobby
5000 Oak Street, Box 151
Kansas City, MO 64112
(816)756-2810
XXAX PAT ID 10364

▲ **St. Louis County Health Department**
Environmental Health Laboratory
111 South Meramec
Clayton, MO 63105
(314)854-6830
MXAO PAT ID 10328

MONTANA

▲ **Maxim Technologies, Inc.**
P.O. Box 30615
600 South 25th Street
Billings, MT 59101
(406)248-9161
MXAO PAT ID 10133

NEW HAMPSHIRE

▲ **Dames & Moore**
5 Industrial Way
Salem, NH 03079-2830
(603)893-0616
XXAX PAT ID 6900

▲ **The Scott Lawson Group, Ltd.**
29 River Road, Ste. 18
P.O. Box 3304
Concord, NH 03302-3304
(603)228-3610
MXAO PAT ID 6902

NEW JERSEY

▲ **Accredited Laboratories, Inc.**
P.O. Box 369
Foot of Pershing Avenue
Carteret, NJ 07008-0369
(908)541-2025
MXXO PAT ID 6966

▲ **Atlantic Environmental, Inc.**
2 East Blackwell St., Ste. 24
Dover, NJ 07801
(201)366-4660
XXAX PAT ID 6978

▲ **Bell Laboratories Division**
Lucent Technologies, Inc.
600 Mountain Ave,Rm 1E-416
Murray Hill, NJ 07974-2070
(908)582-4143
XXAX PAT ID 6999

Bristol-Myers Squibb Co.
One Squibb Dr.
P.O. Box 191
New Brunswick, NJ 08903-0191
(908)519-2412
XXXO PAT ID 7041

▲ **CT&E Environmental Services, Inc.**
Environmental Science Division
One Palmer Terrace
Carlstadt, NJ 07072-2714
(201)939-4280
XXAX PAT ID 6972

▲ **E.I. Dupont Nemours & Company**
Industrial Hygiene Air Laboratory
R.A.S. - Chambers Works
Deepwater, NJ 08023
(609)540-2297
MXXO PAT ID 7003

▲ **EMSL Analytical, Inc.**
108 Haddon Avenue
Westmont, NJ 08108
(609)858-4800
XXAX PAT ID 7012

Exxon Biomedical Sciences, Inc.
IH Laboratory
CN2350, Mettlers Road
East Millstone, NJ 08875-2350
(908)873-6303
MXAO PAT ID 7037

▲ **Hillmann Environmental Co.**
1600 Route 22 East
Union, NJ 07083-1597
(908)688-7800
XXAX PAT ID 6982

NEW JERSEY (con't)

ICI Polyurethanes
286 Mantua Grove Road
West Deptford, NJ 08066-1732
(609)423-8412
XXXO PAT ID 8758

▲ **International Asbestos Testing Lab.(IATL)**
16000 Horizon Way, Unit 100
Mt. Laurel, NJ 08054
(609)231-9449
MXAX PAT ID 7008

Merck & Company, Inc.
Central Industrial Hygiene Lab
P.O. Box 2000, R124-100
Rahway, NJ 07065-0900
(908)594-5618
XXAO PAT ID 6980

▲ **Mobil Oil Corporation**
Environmental Services Laboratory
P.O. Box 1027
Princeton, NJ 08543-1027
(609)737-4571
MXAO PAT ID 7020

▲ **Princeton Analytical Laboratory**
47 Maple Ave.
Flemington, NJ 08822
(908)806-2620
MXAO PAT ID 7021

Warner-Lambert Company
Industrial Hygiene Laboratory
170 Tabor Road
Morris Plains, NJ 07950
(201)540-2863
XXAO PAT ID 6997

NEW YORK

▲ **ATC Environmental, Inc.**
104 East 25th St., 10th floor
New York, NY 10010
(212)353-8280
XXAX PAT ID 7054

▲ **Adirondack Environmental Services, Inc.**
314 North Pearl Street
Albany, NY 12207-1322
(518)434-4546
MXAO PAT ID 7866

▲ **Advanced Environmental Services, Inc.**
P.O. Box 165
Niagara Falls,, NY 14304
(716)283-3120
MXXO PAT ID 8100

▲ **Analytical Laboratories Of Albany, Inc.**
2 Northway Ln, Ste. 4
Latham, NY 12110
(518)783-1600
XXAX PAT ID 7878

▲ **Eastern Analytical Services, Inc.**
4 Westchester Plaza
Elmsford, NY 10523-1601
(914)592-8380
Internet - www.EASInc.com
E-Mail - Lab@Easinc.com
MXAO PAT ID 7658

Eastman Kodak Company
Environmental Analytical Services
Bldg. 320 Kodak Park
Rochester, NY 14650-6274
(716)722-6928
MXAO PAT ID 8140

▲ **Entek Env. & Technical Services, Inc.**
125 DeFreest Dr.
Troy, NY 12180
(518)283-9200
XXAX PAT ID 7872

▲ **Galson Laboratories**
Industrial Hygiene Laboratory
6601 Kirkville Road
East Syracuse, NY 13057
(315)432-0506
MSAO PAT ID 7966

▲ **IBM Hudson Valley Environmental Laboratory**
1580 Route 52
Hopewell Junction, NY 12533-6531
(914)894-9273
MXAO PAT ID 7915

▲ **Kam Consultants**
5 - 17 48th Avenue
Long Island City, NY 11101
(718)729-1997
XXAX PAT ID 7668

▲ **New York Testing Laboratories, Inc.**
84 Kean St.
West Babylon, NY 11704
(516)491-3800
MXAX PAT ID 7794

▲ **Professional Services Industries, Inc.**
25 Dubon Court
Farmingdale, NY 11735
(516)752-1226
MXAX PAT ID 7815

▲ **Taylor Environmental Group, Inc.**
110 Jericho Turnpike
Floral Park, NY 11001-2019
(516)358-2955
XXAX PAT ID 7655

Technical Services Laboratory
Consolidated Edison of NY
31-01 20th Ave., Bldg. 138
Long Island City, NY 11105-2048
(718)204-4137
XXAX PAT ID 7667

▲ **Testwell Craig Laboratories,Inc**
47 Hudson Street, Building B
Ossining, NY 10562
(914)944-2570
XXAX PAT ID 6965

NORTH CAROLINA

▲ **EEC, Inc.**
107 Wind Chime Ct.
Raleigh, NC 27615
(919)846-1016
XXAX PAT ID 9013

▲ **Research Triangle Institute**
Air and Ind. Hygiene Laboratory
P.O. Box 12194,3040 Cornwallis Rd.
Research Triangle Park, NC 27709
(919)541-6136
MSAO PAT ID 9017

▲ **Southern Testing & Research Laboratories**
3809 Airport Dr.
Wilson, NC 27896
(919)237-4175
MXXO PAT ID 9024

State of North Carolina
State Laboratory Division
P.O. Box 28047
Raleigh, NC 27611
(919)733-7308
MSAO PAT ID 9012

OHIO

▲ **Affiliated Environmental Services, Inc.**
3606 Venice Road
Sandusky, OH 44870
(419)627-1976
XXAX PAT ID 9352

OHIO (con't)

▲ American Analytical Laboratories, Inc.
840 South Main Street
Akron, OH 44311-1516
(330)535-1300
MSAO PAT ID 9344

▲ American Electric Power Services Corp.
Environmental Labartory
1 Riverside Plaza
Columbus, OH 43215
(614)836-4221
MSAO PAT ID 9311

▲ Ashland Chemical Co.
P.O. Box 2219
Columbus, OH 43216
(614)790-3482
MXXO PAT ID 9312

Bayer Corporation
Industrial Hygiene Laboratory
356 Three Rivers Pky.
Addyston, OH 45001
(513)467-2283
XXXO PAT ID 9354

▲ Corning Industrial Laboratories, Inc.
7655 Market St., Ste. 2500
Youngstown, OH 44512
(330)758-5788
MXAO PAT ID 9349

▲ DLZ Laboratories, Inc.
6121 Huntley Road
Columbus, OH 43229
(614)848-4333
MSAO PAT ID 9310

▲ DataChem Laboratories, Inc.
4388 Glendale-Milford Road
Cincinnati, OH 45242
(513)733-5336
MXAO PAT ID 9368

▲ Electro-Analytical Group
7118 Industrial Park Boulevard
Mentor, OH 44060-5314
(216)951-3514
MXAO PAT ID 9325

▲ Environmental Chemical Corp. (ECC)
3235 Omni Drive
Cincinnati, OH 45245
(513)752-2950
MXXO PAT ID 9371

▲ Environmental Risk Management - Microbac Labs,
120 May Dr.
Harrison, OH 45030
(513)367-4100
XXAX PAT ID 9356

Eveready Battery Company, Inc.
1280 West 73rd St.
Cleveland, OH 44101-2021
(216)634-7920
MXXO PAT ID 9328

▲ Fore Testing Laboratories, Inc.
6015 Manning Road
Miamisburg, OH 45342
(513)866-5908
MXXO PAT ID 9375

GE Lighting
Env., Health & Safety Dept.
1975 Noble Road
Cleveland, OH 44112-6300
(216)266-3349
MXXO PAT ID 9330

▲ Goodyear Tire & Rubber Company
Industrial Hygiene Laboratory
1144 East Market Street
Akron, OH 44316-0001
(330)796-1949
MXAO PAT ID 9345

▲ Hematology & Environmental Laboratory
Univ. of Cincinnati, Kettering Lab
3223 Eden Avenue
Cincinnati, OH 45267-0056
(513)558-1705
MXXX PAT ID 9374

ICI Paints North America
Analytical Services Department
16651 Sprague Road
Strongsville, OH 44136-1739
(216)826-5314
MXXO PAT ID 9338

▲ Lockheed Martin Utility Services, Inc.
Development Laboratory
P.O. Box 628, Mail Stop 2212
Piketon, OH 45661
(614)897-2469
MSAO PAT ID 9384

▲ Lyle Laboratories
1507 Chambers Road
Columbus, OH 43212
(614)488-1022
MXAO PAT ID 9307

Mead Corporation
3475 Newmark Drive
Miamisburg, OH 45342
(513)495-9234
MXXO PAT ID 9378

NIOSH
DPSE Measurement Research Support
4676 Columbia Pkwy., M.S. R3
Cincinnati, OH 45226
(513)841-4321
MXAO PAT ID 9362

Owens-Corning Science & Technology Center
Analytical Serv. R&D Laboratory
2790 Columbus Road, Rt. 16
Granville, OH 43023-1200
(614)321-8098
MSAO PAT ID 9297

Ross Analytical Services, Inc.
16433 Foltz Industrial Pky.
Strongsville, OH 44136
(216)572-3200
MXXO PAT ID 9339

▲ State of Ohio Dept. of Health
Div. of Public Health Labs.
1571 Perry Street
Columbus, OH 43216-0068
(614)644-4634
MXXO PAT ID 9305

▲ TolTest, Inc.
1810 N. 12th Street
Toledo, OH 43603
(419)241-7175
XXAX PAT ID 9319

UCAR Carbon Company, Inc.
Parma Technical Center
12900 Snow Rd.
Parma, OH 44130
(216)676-2381
MXAO PAT ID 9327

OKLAHOMA

Phillips Petroleum Company
Industrial Hygiene Laboratory
209 CPL Building- PRC
Bartlesville, OK 74004
(918)661-3648
MXXO PAT ID 10541

▲ Standard Testing & Engineering Company
3400 North Lincoln Boulevard
Oklahoma City, OK 73105
(405)528-0541
MXAX PAT ID 10522

OREGON

State of Oregon
Occupational Health
Lab-OR-OSHA
505 SE 12th Ave.
Portland, OR 97214
(503)731-8398
MSAO PAT ID 11507

PENNSYLVANIA

▲ **Accredited Environmental Technologies, Inc.**
28 North Pennell Road
Medina, PA 19063
(610)891-0114
XXAX PAT ID 8637

▲ **Allegheny Mountain Research, Inc.**
R.D. #1, Box 243A
Berlin, PA 15530
(814)267-4404
XXAX PAT ID 8260

Aluminum Company of America
Alcoa Technical Center
100 Technical Drive
Alcoa Center, PA 15069-0001
(412)337-2154
MSAO PAT ID 8189

Bayer Corporation
Corporate Ind. Hyg. Laboratory
100 Bayer Road
Pittsburgh, PA 15205-9741
(412)777-7473
XXXO PAT ID 8212

▲ **Camtech, Inc.**
McKnight Ivory Building
4550 McKnight Rd., Ste 202
Pittsburgh, PA 15237
(412)931-1210
XXAX PAT ID 8193

Criterion Laboratories, Inc.
3370 Progress Dr., Ste. J
Bensalem, PA 19020
(215)244-1300
XXAX PAT ID 8654

▲ **Eagle Industrial Hygiene Associates**
359 Dresher Road
Horsham, PA 19044-2129
(215)672-6088
XXAX PAT ID 8649

▲ **Exide Corporation**
Industrial Hygiene Laboratory
6313 Rising Sun Avenue
Philadelphia, PA 19111
(215)342-1414
MXXX PAT ID 8644

▲ **Free-Col Laboratories, Inc.**
P.O. Box 557
11618 Cotton Road
Meadville, PA 16335-0557
(814)724-6242
MSAO PAT ID 8342

▲ **GSP Environmental Sampling, Inc.**
2024 Noble St.
Swissvale, PA 15218
(412)271-4090
XXAX PAT ID 8223

▲ **Galson Corporation**
5170 Campus Dr., Ste 200
Plymouth Meeting, PA 19462
(610)834-7288
XXAX PAT ID 8628

▲ **Industrial Health Foundation, Inc.**
Analytical Laboratory
34 Penn Circle West
Pittsburgh, PA 15206
(412)363-6600
MSAO PAT ID 8219

▲ **Lancaster Laboratories**
2425 New Holland Pike
P.O. Box 12425
Lancaster, PA 17605-2425
(717)656-2300
MXAO PAT ID 8477

Lucent Technologies Environmental Laboratory
20F-114BG
555 Union Blvd.
Allentown, PA 18103
(610)712-5505
MXXO PAT ID 8523

▲ **MDS Laboratories**
4418 Pottsville Pike
Reading, PA 19605
(610)921-8833
MXAO PAT ID 8707

PPG Industries
Monroeville Technical Center
440 College Park Drive
Monroeville, PA 15146
(412)325-5272
MXAO PAT ID 9342

PPG Industries Coatings/Resins Group
Industrial Hygiene Laboratory
4325 Rosanna Drive
Allison Park, PA 15101
(412)492-5275
MXXO PAT ID 8203

▲ **PSI - Pittsburgh Testing Laboratory**
850 Poplar Street
Pittsburgh, PA 15220
(412)922-4000
XXAX PAT ID 8222

▲ **RJ Lee Group, Inc.**
350 Hochberg Road
Monroeville, PA 15146
(412)325-1776
MSAO PAT ID 8204

Rohm & Haas Company
Corporate IH Laboratory
P.O. Box 219, Bldg. 155
Bristol, PA 19007
(215)785-8817
XXXO PAT ID 8653

SKC, Inc.
Research & Development
Laboratory
863 Valley View Rd.
Eighty Four, PA 15530-9614
(412)941-9704
XXXO PAT ID 8239

▲ **SSM/Laboratories, Inc.**
30 Noble Street
P.O. Box 6527
Reading, PA 19611-0527
(610)376-4595
MXAO PAT ID 8723

▲ **Smith Environmental Technologies Corp.**
1850 Gravers Road. West
Norristown, PA 19401-2813
(610)272-4208
XXAX PAT ID 8690

▲ **UEC**
IH & Env. Health Laboratory
4000 Tech Center Dr., MS #15
Monroeville, PA 15146
(412)825-2400
MSAO PAT ID 8182

▲ **Volz Environmental Services, Inc.**
1200 Gulf Lab Road
Pittsburgh, PA 15238
(412)826-8480
XXAX PAT ID 8215

PENNSYLVANIA (con't)

Zinc Corporation of America
Industrial Hygiene Laboratory
300 Frankfurt Road
Monaca, PA 15061-2295
(412)774-1020
MXXX PAT ID 8187

SOUTH CAROLINA

▲ Azimuth, Inc.
9229 University Boulevard
Charleston, SC 29406
(803)553-9456
MXAO PAT ID 9044

Kemet Electronics Corporation
P.O. Box 5928
Greenville, SC 29606-5928
(864)963-6300
MXXO PAT ID 9058

▲ Michelin Tire Corporation
Industrial Hygiene Laboratory
P.O. Box 2846
Greenville, SC 29602-2846
(864)458-1532
MSAO PAT ID 9057

South Carolina Dept. of Health & Env. Control
Bureau of Laboratories
P.O. Box 2202
Columbia, SC 29202
(803)935-7003
MXAO PAT ID 9041

Westinghouse Savannah River Co.
Industrial Hygiene Laboratory
Building 735-A
Aiken, SC 29801
(803)725-5277
MXAO PAT ID 9063

TENNESSEE

ACS
445 First St.
Arnold AFB, TN 37389-3400
(615)454-7349
MXAO PAT ID 9237

▲ Eastman Chemical Company
IH Analytical Laboratory
P.O. Box 1975
Kingsport, TN 37662-5215
(423)229-5916
MSAO PAT ID 9241

Lockheed Martin Energy Systems
P.O.Box 2003, Hwy.58 @ Blair Rd
K1004D, Room 26, MS-7275
Oak Ridge, TN 37831-7275
(423)574-9769
MXAO PAT ID 9243

Lockheed Martin Energy Systems
Y-12 Analytical Srvcs. Organiz.
P.O. Box 2009
Oak Ridge, TN 37831-8190
(423)574-2430
MSAO PAT ID 9244

Oak Ridge National Laboratory
Industrial Hygiene Laboratory
P.O.Box 2008, Bldg. 3550
Oak Ridge, TN 37831-6292
(423)574-9765
MXAO PAT ID 9242

▲ Planning, Design & Research Engineers, Inc.
2000 Lindell Ave.
Nashville, TN 37203
(615)298-2065
XXAX PAT ID 9232

▲ Resource Consultants, Inc.
7121 Cross Roads Boulevard
P.O. Box 1848
Brentwood, TN 37024-1848
(615)373-5040
MXXO PAT ID 9227

▲ Specialized Assays, Inc.
2960 Foster Creighton Drive
P.O. Box 40566
Nashville, TN 37204-0566
(615)726-0177
MXXO PAT ID 9228

▲ TVA Environmental Chemistry
150 401 Chestnut Street
Corporate Center 1A
Chattanooga, TN 37402-2801
(423)751-3705
MXXO PAT ID 9238

Tennessee Department of Labor
Occ.Health Lab/3rd Fl,Gateway
710 James Robertson Parkway
Nashville, TN 37243-0659
(615)741-2750
MSAO PAT ID 9236

TEXAS

▲ Aer-Aqua Laboratories, Inc.
P.O. BOX 8608
The Woodlands, TX 77378
MXXO PAT ID 10670

▲ Armstrong Forensic Laboratory
330 Loch'n Green Trail
Arlington, TX 76012-3481
(817)275-2691
MSAO PAT ID 10610

Armstrong Laboratory (OEHD)
AL/OEAT Certification Review
2402 E Drive
Brooks AFB, TX 78235-5114
(210)536-3626
MSAO PAT ID 10714

▲ Cam Environmental Services
312 South Richey
Pasadena, TX 77506
(713)475-9003
MXAX PAT ID 10652

▲ Chemtex Env. & Industrial Hygiene Services
3082 25th Street
Port Arthur, TX 77642
(409)983-4575
MXAO PAT ID 10696

▲ Ctek Industrial Hygiene Laboratory
9742 Skillman St.
Dallas, TX 75243
(214)343-2025
MSAO PAT ID 10571

Environmental Health Laboratory
NASA/Johnson Space Center
Mail Code SD/23
Houston, TX 77058-3696
(713)483-6726
MXAO PAT ID 10647

▲ Envirotest, Inc.
3902 Braxton Drive
Houston, TX 77063
(713)782-4411
MXAX PAT ID 10643

Exxon Chemical Americas
5000 Bayway Drive
Baytown, TX 77520
(713)425-2580
XXXO PAT ID 10685

▲ Gemini Analytical Services
2511-A Leopard Street
Corpus Christi, TX 78408
(512)884-7445
MXXO PAT ID 10726

TEXAS (con't)

▲ HIH Laboratory, Inc.
100 E. NASA Road I. Suite 210
P.O. Box 58765
Houston, TX 77258-8765
(713)338-9000
MSAO PAT ID 10646

Lockheed Martin Tactical Aircraft
Hazardous Materials Mgmt. Lab
P.O. Box 748 MZ 6875
Fort Worth, TX 76101
(817)777-8635
MXAO PAT ID 10616

Lubrizol Corporation
P.O. Box 158
41 Tidal Road
Deer Park, TX 77536-0158
(713)884-5386
XXAO PAT ID 10688

▲ McKee Environmental Health Inc.
303 Westfield Lane
Friendswood, TX 77546-6316
(713)482-3403
XXAX PAT ID 10663

Monsanto Company
Industrial Hygiene
P.O. Box 711
Alvin, TX 77512-9888
(713)393-4011
XXXO PAT ID 10684

Pantex Industrial Hygiene Laboratory
P.O. Box 30020
Amarillo, TX 79177
(806)477-4439
MXAO PAT ID 10741

Quemetco Laboratories
2804 Sea Harbor
Dallas, TX 75212
(214)583-0327
MXXX PAT ID 10576

▲ Raba-Kistner Consultants, Inc.
Analytical Chemistry Laboratory
12821 West Golden Lane
San Antonio, TX 78249
(210)699-9090
XXAX PAT ID 10716

Radian International LLC
P.O. Box 201088
Austin, TX 78720-1088
(512)454-4797
MXXO PAT ID 10735

Shell Development Company
Industrial Hygiene Laboratory
P.O. Box 1380
Houston, TX 77251-1380
(713)544-7113
XXXO PAT ID 10631

Sterling Chemicals
Texas City Industrial Hygiene
P.O. Box 1311
Texas City, TX 77592
(409)942-3628
XXXO PAT ID 10693

▲ TRI/Environmental, Inc.
Env. & Ind.Hyg. Laboratory
9063 Bee Caves Road
Austin, TX 78733-6201
(512)263-2101
MXXO PAT ID 10730

Texas Eastman Division
Eastman Chemical Co., IH Lab
P.O. Box 7444
Longview, TX 75607
(903)237-6218
MXAO PAT ID 13218

▲ USPHS, FOH, NERL, DALLAS
1200 Main Tower Building
Room 1800 PH5 - 3
Dallas, TX 75202-4389
(214)767-3577
XXAX PAT ID 16905

Union Carbide Corporation
Ind. Hygiene Laboratory, Bldg. 133
P.O. Box 471, 5th Ave. South
Texas City, TX 77592-0471
(409)948-5589
MXAO PAT ID 10692

Union Carbide Corporation
IH Laboratory - Seadrift Plant
P.O. Box 186
Port Lavaca, TX 77979-0186
(512)553-2693
XXXO PAT ID 10702

UTAH

▲ ASARCO/American Environmental Consultants
3422 South 700 West
Salt Lake City, UT 84119-4191
(801)262-2459
MSAX PAT ID 10846

▲ DataChem Laboratories, Inc.
960 West LeVoy Drive
Salt Lake City, UT 84123-2547
(801)266-7700
MSAO PAT ID 10841

▲ Dixon Information, Inc.
78 West 2400 South
South Salt Lake, UT 84115-3013
(801)486-0800
XXAX PAT ID 10847

Kennecott Env. & Ind. Hyg. Lab. (KEL)
9600 West 2100 South
P.O. Box 6001
Magna, UT 84044-6001
(801)569-7950
MSAX PAT ID 10848

▲ Thiokol Corporation
P.O. Box 707
Mail Stop 245
Brigham City, UT 84302-0707
(801)863-3511
MXAO PAT ID 10851

US Department of Labor (OSHA)
Salt Lake Technical Center
1781 South 300 West, PO Box 65200
Salt Lake City, UT 84165-0200
(801)487-0073
MSAO PAT ID 10842

VIRGINIA

▲ American Medical Laboratories
14225 Newbrook Drive
Chantilly, VA 22021-0841
(703)802-6900
MXAO PAT ID 8900

▲ Applied Environmental, Inc.
11800 Sunrise Valley Drive
Suite 1200
Reston, VA 22091
(703)648-0822
XXAX PAT ID 8907

▲ Enviro Dynamics, Inc.
7923 Jones Branch Rd., Ste. 201
McLean, VA 22102
(703)760-0023
XXAX PAT ID 8921

▲ Environmental Hazards Services, Inc.
7469 White Pine Road
Richmond, VA 23237
(804)275-4788
MXAX PAT ID 8648

VIRGINIA (con't)

Environmental Testing Services, Inc.
P.O. Box 12715
888 Norfolk Square
Norfolk, VA 23502
(804)461-3874
MXXX PAT ID 8951

▲ LabCorp Analytics Laboratory
8040 Villa Park Drive
Richmond, VA 23228
(800)888-8061
MSAO PAT ID 8940

▲ Marine Chemist Service
11850 Tug Boat Lane
Newport News, VA 23606
(757)873-0933
MXAX PAT ID 8961

Navy Env. & Preventive Medicine Unit 2
1887 Powhatan Street
Norfolk, VA 23511-3394
(757)444-7671
MXAO PAT ID 12013

Newport News Shipbuilding
Laboratory Services, Dept. 031
4101 Washington Ave.
Newport News, VA 23607
(804)688-4002
MXAO PAT ID 8964

▲ Pacific Environmental Services, Inc.
560 Herndon Pky., Ste 200
Herndon, VA 20170-5240
(703)471-8383
XXAX PAT ID 9015

▲ RJ Lee Group, Inc.
10503 Battleview Parkway
Manassas, VA 22110
(703)368-7880
XXAX PAT ID 8913

▲ Schneider Laboratories, Inc.
2512 West Cary Street
Richmond, VA 23220-5117
(804)353-6778
MSAO PAT ID 8936

▲ TC Analytics, Inc.
1200 Boissevain Avenue
Norfolk, VA 23507
(804)627-0400
MXAO PAT ID 8950

▲ Versar, Inc.
Industrial Hygiene Laboratory
6850 Versar Center
Springfield, VA 22151
(703)750-3000
XXAX PAT ID 8917

WASHINGTON

Boeing Industrial Hygiene Laboratory
P.O. Box 3707
MS 8H - 08
Seattle, WA 98124-2207
(206)773-1481
MXAO PAT ID 11557

▲ Clayton Environmental Consultants, Inc.
4636 East Marginal Way South
Suite 215
Seattle, WA 98134
(206)763-7364
XXAX PAT ID 11549

▲ Med-Tox Northwest
19032 66th Avenue, South
Suite C-105
Kent, WA 98032
(206)656-2920
XXAX PAT ID 11542

▲ Prezant Associates, Inc.
330 6th Avenue North
Suite 200
Seattle, WA 98109
(206)281-8858
MXAO PAT ID 11554

Rust Federal Services of Hanford, Inc.
Waste Sampling & Char. Facility
P.O. Box 700, MSIN S3-28
Richland, WA 99352
(509)373-7185
MSAO PAT ID 11575

State of Washington
Dept. of Labor & Industries
805 Plum St. SE First Floor
Olympia, WA 98504-4613
(360)902-5171
MSAO PAT ID 11589

▲ University of Washington
Env. Health Lab/Health Science Bldg
SC-34, Room F-461
Seattle, WA 98195
(206)543-4253
MSAO PAT ID 11569

WEST VIRGINIA

▲ Environmental Services, Inc.
6404 MacCorkle Avenue, S.W.
St. Albans, WV 25177
(304)768-2233
XXAX PAT ID 8986

Union Carbide Corporation
Health & Industrial Hygiene Lab
P.O. Box 8361
South Charleston, WV 25303
(304)747-5352
XXXO PAT ID 8985

WISCONSIN

▲ Industrial Hygiene Technologies
2522 Rimrock Rd.
Madison, WI 53713-2741
(608)277-8188
XXXO PAT ID 14121

Johnson Controls, Inc.
Analytical Services Dept. B-3
P.O. Box 591
Milwaukee, WI 53201
(414)228-2365
MXXX PAT ID 10064

▲ Prism Analytical, Inc.
3802 Packers Ave., Ste. 6
Madison, WI 53704
(608)249-8680
MXAO PAT ID 10073

▲ Sentry Services - IH Division
1800 North Point Drive
Stevens Point, WI 54481
(800)443-9655
MSAO PAT ID 10081

▲ Wausau Insurance Companies
Environmental Health Laboratory
2000 Westwood Drive
Wausau, WI 54401
(715)842-6810
MSAO PAT ID 10080

▲ West Allis Memorial Hospital
Industrial Toxicology Lab
8901 West Lincoln Avenue
West Allis, WI 53227
(414)328-7945
MXAX PAT ID 10070

▲ Wisconsin Occupational Health Laboratory
979 Jonathon Drive
Madison, WI 53713-3226
(800)446-0403
MSAO PAT ID 10074

CANADA

▲ AGAT Laboratories, Ltd.
3650 21st Street N.E.
Calgary, Alberta, T2E 6V6
Canada
MSAO PAT ID 11662

▲ ETL Chemspec Analytical, Ltd.
Enviro-Test Laboratories
2nd floor, 10158-103 Street
Edmonton, Alberta, T5J OX6
Canada
(403)413-5265
MSAO PAT ID 11663

▲ ETL Manitoba Technology Centre Ltd.
745 Logan Avenue
Winnipeg, Manitoba, R3E 3L5
Canada
(204)945-1778
MXAO PAT ID 11631

▲ ICI Canada Inc.
Sheridan Park Research Center
2101 Hadwen Rd.
Mississauga, Ontario, L5K 2L3
Canada
(905)823-7160
MXXO PAT ID 11639

▲ IRSST
505 W. Maisonneuve
14th Floor
Montreal, Quebec, H3A 3C2
Canada
(514)288-1551
MSAO PAT ID 11634

▲ McGill University
Env.Research Lab, Room 23
3450 University Street
Montreal, Quebec, H3A 2A7
Canada
(514)398-5060
MXXO PAT ID 11649

▲ Noranda Metallurgy, Inc.
Horne Smelter
Environmental & IH Laboratory
P.O. Box 2415
Rouyn-Noranda, Quebec, J9X 5A9
Canada
(819)762-5198
MXXX PAT ID 11648

▲ Occupational & Environmental Health Lab
McMaster University
1200 Main St. West, Rm. 3H50
Hamilton, Ontario, L8N 3Z5
Canada
(905)525-9140
MSAO PAT ID 11641

HONG KONG

▲ Hong Kong University of Science & Technology
Safety & Env. Protection Office
Clear Water Bay
Kowloon,
Hong Kong
8522-358-6510
MXXO PAT ID 13060

JAPAN

DET 3, Armstrong Laboratory (AFMC)
Unit 5213, Building 850
APO, AP 96368-5213
81-611-734-1769
MXAO PAT ID 11465

▲ Okinawa Environmental Analysis Center
3 - 11 - 7 Maehara
Ginowan City
Okinawa, 901-22,
Japan
098-897-9010
XXAX PAT ID 11693

SPAIN

FREMAP Industrial Hygiene Laboratory
Carretera de Pozuela a
Majadahonda, Km. 3500, 28220
Madrid,
Spain
(341)626-5508
MSAO PAT ID 11716

▲ Laboratorios Contox, S.A.
Cronos, 8
28037 Madrid,
Spain
34-1-754-1211
MXAO PAT ID 11711

TAIWAN

▲ Industrial Technology Research Institute
Bldg. 30, 195 Chung Hsing Road
Section 4
Chutung, Hsinchu,
Taiwan, R.O.C. 310
886-35-917620
MXAO PAT ID 11726

ORG #	ORGANIZATION NAME	STATE/COUNTRY
10101	3M Company	MN
14857	3M Environmental Laboratory	MN
9524	AAC Trinity, Inc.	MI
10232	Abbott Laboratories	IL
8637	Accredited Environmental Technologies, Inc.	PA
6966	Accredited Laboratories, Inc.	NJ
10277	Acme Steel Company	IL
9237	ACS	TN
7866	Adirondack Environmental Services, Inc.	NY
11873	Advanced Chemical Sensors	FL
8100	Advanced Environmental Services, Inc.	NY
10670	Aer-Aqua Laboratories, Inc.	TX
11354	Aerojet Analytical Laboratories	CA
9352	Affiliated Environmental Services, Inc.	OH
11662	AGAT Laboratories, Ltd.	Canada
10239	Aires Consulting Group, Inc.	IL
11652	Algoma Steel, Inc. TEMP SUSPENSION	Canada
8260	Allegheny Mountain Research, Inc.	PA
8189	Aluminum Company of America	PA
8863	AMA Analytical Services, Inc.	MD
10477	American Analytical & Technical Services	LA
9344	American Analytical Laboratories, Inc.	OH
9311	American Electric Power Services Corp.	OH
11134	American Environmental Network, Inc.	CA
9133	American Environmental Network	FL
10221	American Foundrymen's Society, Inc.	IL
10504	American Interplex Corporation	AR
8900	American Medical Laboratories	VA
10266	Amoco Corporation	IL
9096	Analytical Environmental Services, Inc.	GA
7878	Analytical Laboratories Of Albany, Inc.	NY
9294	Analytical Management, Inc.	KY
8844	Apex Environmental, Inc.	MD
8907	Applied Environmental, Inc.	VA
10107	Applied Environmental Sciences, Inc.	MN
10253	Argonne National Laboratory	IL
10860	Arizona Dept. of Health Services	AZ
10610	Armstrong Forensic Laboratory	TX
10714	Armstrong Laboratory (OEHD)	TX
10846	ASARCO/American Environmental Consultants	UT
9312	Ashland Chemical Co.	OH
11124	Assay Technology, Inc.	CA
7054	ATC Environmental, Inc. NY	NY
10771	ATC Environmental, Inc. CO	CO
9398	Atec Associates, Inc.	IN
6978	Atlantic Environmental, Inc.	NJ
9044	Azimuth, Inc.	SC
9447	Ball Corporation, Chemistry Laboratory	IN
6951	Baron Consulting Company, Inc.	CT
9565	BASF Corporation	MI
8737	Batta Laboratories, Inc.	DE
9354	Bayer Corporation	OH
8212	Bayer Corporation	PA
10367	Bayer Corporation	MO
6999	Bell Laboratories Division	NJ
11557	Boeing Industrial Hygiene Laboratory	WA

ORG #	ORGANIZATION NAME	STATE/COUNTRY
10109	Braun Intertec Corporation	MN
7041	Bristol-Myers Squibb Co.	NJ
11154	California Dept. of Health Services	CA
10652	Cam Environmental Services	TX
8193	Camtech, Inc.	PA
9100	Cape Environmental Management, Inc.	GA
10269	Carnow, Conibear & Associates, Ltd.	IL
10338	Central Region Environmental Laboratory	MO
10411	Certified Environmental Management	KS
6952	ChemScope, Inc.	CT
10696	Chemtex Env. & Industrial Hygiene Services	TX
11549	Clayton Environmental Consultants, Inc.	WA
9074	Clayton Environmental Consultants	GA
11142	Clayton Environmental Consultants, Inc.	CA
9532	Clayton Environmental Consultants, Inc.	MI
10242	ComEd, CTEAM-SMAD	IL
6871	Commonwealth of Massachusetts	MA
6838	Con-Test Analytical	MA
6935	Connecticut Dept. of Health Services	CT
11495	Consolidated Industrial Hygiene Lab.	HI
9349	Corning Industrial Laboratories, Inc.	OH
9636	Corrosion Control Consultants & Labs, Inc.	MI
8654	Criterion Laboratories, Inc.	PA
6972	CT&E Environmental Services, Inc.	NJ
10571	Ctek Industrial Hygiene Laboratory	TX
10967	CTL Environmental Services	CA
9580	CzarTech Analytical, Inc.	MI
6900	Dames & Moore	NH
9368	DataChem Laboratories, Inc.	OH
10841	DataChem Laboratories, Inc.	UT
10758	DCM Science Laboratory	CO
11054	Design for Health	CA
11465	DET 3, Armstrong Laboratory (AFMC)	AP
19902	Div.of Fed. Occup. Health Env.Laboratory	IL
10847	Dixon Information, Inc.	UT
9310	DLZ Laboratories, Inc.	OH
9583	Dow Chemical Company	MI
9582	Dow Corning Corporation	MI
6858	Duracell, Inc.	MA
8736	E.I. du Pont de Nemours & Company	DE
7003	E.I. Dupont Nemours & Company	NJ
8649	Eagle Industrial Hygiene Associates	PA
7658	Eastern Analytical Services, Inc.	NY
9241	Eastman Chemical Company	TN
8140	Eastman Kodak Company	NY
9013	EEC, Inc.	NC
10513	EEG, Inc.	AR
9325	Electro-Analytical Group	OH
10963	EMS Laboratories, Inc.	CA
7012	EMSL Analytical, Inc.	NJ
7872	Entek Env. & Technical Services, Inc.	NY
10480	Entek Environmental Laboratories, Inc.	LA
8921	Enviro Dynamics, Inc.	VA
6938	EnviroMed Services, Inc.	CT
9371	Environmental Chemical Corp. (ECC)	OH
8648	Environmental Hazards Services, Inc.	VA

ORG #	ORGANIZATION NAME	STATE/COUNTRY
9107	Environmental Health Laboratory	GA
10647	Environmental Health Laboratory	TX
6945	Environmental Health Laboratory	CT
10863	Environmental Management Consultants	AZ
9356	Environmental Risk Management/Microbac Labs,	OH
9135	Environmental Science & Engineering, Inc.	FL
8986	Environmental Services, Inc.	WV
8734	Environmental Testing, Inc.	DE
8951	Environmental Testing Services, Inc.	VA
10643	Envirotest, Inc.	TX
6851	ESA Laboratories, Inc.	MA
11663	ETL Chemspec Analytical, Ltd.	Canada
11631	ETL Manitoba Technology Centre Ltd.	Canada
9328	Eveready Battery Company, Inc.	OH
8644	Exide Corporation	PA
7037	Exxon Biomedical Sciences, Inc.	NJ
10685	Exxon Chemical Americas	TX
10873	Fiberquant Analytical Services	AZ
8877	FMC Corporation	MD
9560	Ford Motor Company	MI
9375	Fore Testing Laboratories, Inc.	OH
10957	Forensic Analytical	CA
11143	Forensic Analytical Specialties, Inc.	CA
8342	Free-Col Laboratories, Inc.	PA
11716	FREMAP Industrial Hygiene Laboratory	Spain
10794	FRS Geotech, Inc.	CO
8628	Galson Corporation	PA
7966	Galson Laboratories	NY
8885	Gascoyne Laboratories	MD
9330	GE Lighting	OH
10726	Gemini Analytical Services	TX
9345	Goodyear Tire & Rubber Company	OH
8223	GSP Environmental Sampling, Inc.	PA
9271	Guardian Laboratories LLC	KY
10985	Health Science Associates	CA
9374	Hematology & Environmental Laboratory	OH
10646	HIH Laboratory, Inc.	TX
6982	Hillmann Environmental Co.	NJ
13060	Hong Kong University of Science & Technology	Hong Kong
10995	Hygeia Environmental Laboratories, Inc.	CA
6855	Hygeia ProScience Laboratories, Inc.	MA
6963	HYGENIX, Inc.	CT
11176	IBM Corporation	CA
10115	IBM Corporation	MN
7915	IBM Hudson Valley Environmental Laboratory	NY
11639	ICI Canada Inc.	Canada
9338	ICI Paints North America	OH
8758	ICI Polyurethanes	NJ
6859	IEA - MA, Inc.	MA
8886	IH Services, Inc.	MD
10478	Inchcape Testing Services	LA
8219	Industrial Health Foundation, Inc.	PA
14121	Industrial Hygiene Technologies	WI
11726	Industrial Technology Research Institute	Taiwan, R.O.C. 310
10326	Industrial Testing Laboratories	MO
10827	INEL Industrial Hygiene Laboratory	ID

ORG #	ORGANIZATION NAME	STATE/COUNTRY
10102	Institute for Environmental Assessment	MN
7008	International Asbestos Testing Lab.(IATL)	NJ
11634	IRSST	Canada
11103	ITEK Enviro Services, Inc.	CA
6942	ITT Hartford Insurance Group	CT
10264	JMS Environmental Associates, Ltd.	IL
10064	Johnson Controls, Inc.	WI
7668	Kam Consultants	NY
11109	Kellco Services, Inc.	CA
9058	Kemet Electronics Corporation	SC
10848	Kennecott Env. & Ind. Hyg. Lab. (KEL)	UT
9285	Kentucky Cabinet for Health Services	KY
10250	Keter Consultants, Inc.	IL
8940	LabCorp Analytics Laboratory	VA
11711	Laboratorios Contox, S.A.	Spain
8477	Lancaster Laboratories	PA
9159	Law Engineering and Environmental Services	FL
11138	Lawrence Livermore National Laboratory	CA
6852	Liberty Mutual Insurance Co.	MA
9244	Lockheed Martin Energy Systems	TN
9243	Lockheed Martin Energy Systems	TN
10616	Lockheed Martin Tactical Aircraft	TX
9384	Lockheed Martin Utility Services, Inc.	OH
10688	Lubrizol Corporation	TX
8523	Lucent Technologies Environmental Laboratory	PA
9307	Lyle Laboratories	OH
8849	ManTech Environmental Corporation	MD
8961	Marine Chemist Service	VA
8876	Maryland Dept of Health & Mental Hygiene	MD
10133	Maxim Technologies, Inc.	MT
10340	McDonnell Douglas Corporation	MO
11649	McGill University	Canada
10663	McKee Environmental Health Inc.	TX
8707	MDS Laboratories	PA
9378	Mead Corporation	OH
11542	Med-Tox Northwest	WA
6980	Merck & Company, Inc.	NJ
9057	Michelin Tire Corporation	SC
9590	Michigan Dept. of Consumer & Industry Serv.	MI
9403	Micro Air, Inc.	IN
11150	Micro Analytical Laboratories, Inc.	CA
10342	Microscopic Analysis, Inc.	MO
6876	MIT Industrial Hygiene Lab	MA
7020	Mobil Oil Corporation	NJ
9208	Monsanto Chemical Company	AL
10684	Monsanto Company	TX
9134	Monsanto Company	FL
10345	Monsanto Company	MO
10447	Monsanto Company	LA
9218	Monsanto Company-Anniston Plant	AL
10307	Monsanto Company , W.G. Krummrich Plant	IL
10047	Monsanto Industrial Hygiene Laboratory	IA
11487	Muranaka Environmental Consultants, Inc.	HI
6947	Mystic Air Quality Consultants	CT
10227	NATLSCO, a KRMS Company	IL
11051	Navy Env. & Preventive Medicine Unit Five	CA

ORG #	ORGANIZATION NAME	STATE/COUNTRY
12013	Navy Env. & Preventive Medicine Unit 2	VA
10013	NET, Inc.	IA
7794	New York Testing Laboratories, Inc.	NY
8964	Newport News Shipbuilding	VA
9362	NIOSH	OH
11648	Noranda Metallurgy, Inc. Horne Smelter	Canada
10190	Northbrook Environmental Sciences Laboratory	IL
6912	Northeast Test Consultants	ME
10104	Nova Environmental Services, Inc.	MN
9242	Oak Ridge National Laboratory	TN
11641	Occupational & Environmental Health Lab	Canada
11693	Okinawa Environmental Analysis Center	Japan
6955	Olin Environmental Hygiene Laboratory	CT
8860	Oneil M. Banks, Inc.	MD
9297	Owens-Corning Science & Technology Center	OH
9015	Pacific Environmental Services, Inc.	VA
9291	Paducah Gaseous Diffusion Plant	KY
10741	Pantex Industrial Hygiene Laboratory	TX
11002	Performance Analytical, Inc.	CA
9592	Pharmacia & Upjohn Inc.	MI
10541	Phillips Petroleum Company	OK
9232	Planning, Design & Research Engineers, Inc.	TN
9138	Post, Buckley, Schuh & Jernigan, Inc.	FL
9342	PPG Industries	PA
8203	PPG Industries Coatings/Resins Group	PA
11554	Prezant Associates, Inc.	WA
7021	Princeton Analytical Laboratory	NJ
10073	Prism Analytical, Inc.	WI
10391	Professional Service Industries, Inc.	KS
7815	Professional Services Industries, Inc.	NY
8222	PSI - Pittsburgh Testing Laboratory	PA
10576	Quemetco Laboratories	TX
10716	Raba-Kistner Consultants, Inc.	TX
10735	Radian International LLC	TX
9017	Research Triangle Institute	NC
10768	Reservoirs Environmental Services, Inc.	CO
9227	Resource Consultants, Inc.	TN
9212	Reynolds Metals Company	AL
8913	RJ Lee Group, Inc.	VA
11157	RJ Lee Group	CA
8204	RJ Lee Group, Inc.	PA
8653	Rohm & Haas Company	PA
9339	Ross Analytical Services, Inc.	OH
9224	Roy F. Weston, Inc.	AL
11575	Rust Federal Services of Hanford, Inc.	WA
9200	Safety Environmental Laboratories, Inc.	AL
11106	SCA Environmental, Inc.	CA
8936	Schneider Laboratories, Inc.	VA
10772	Schuller International	CO
10081	Sentry Services - IH Division	WI
10631	Shell Development Company	TX
8239	SKC, Inc.	PA
8690	Smith Environmental Technologies Corp.	PA
9041	South Carolina Dept. of Health & Env. Control	SC
9202	Southern Research Institute	AL
9024	Southern Testing & Research Laboratories	NC

ORG #	ORGANIZATION NAME	STATE/COUNTRY
9228	Specialized Assays, Inc.	TN
10364	Specialized Scientific Services, LLC	MO
11104	SRI International	CA
8723	SSM/Laboratories, Inc.	PA
10328	St. Louis County Health Department	MO
10522	Standard Testing & Engineering Company	OK
11115	State Compensation Insurance Fund	CA
9012	State of North Carolina	NC
9305	State of Ohio Dept. of Health	OH
11507	State of Oregon	OR
11589	State of Washington	WA
10693	Sterling Chemicals	TX
7655	Taylor Environmental Group, Inc.	NY
8950	TC Analytics, Inc.	VA
11882	Technical Micronics Control, Inc.	AL
7667	Technical Services Laboratory	NY
9236	Tennessee Department of Labor	TN
6965	Testwell Craig Laboratories,Inc	NY
13218	Texas Eastman Division	TX
6902	The Scott Lawson Group, Ltd.	NH
6944	The Travelers Indemnity Company	CT
10851	Thiokol Corporation	UT
9319	TolTest, Inc.	OH
8848	Tracor Applied Sciences, Inc.	MD
6940	TRC Environmental Corporation	CT
10730	TRI/Environmental, Inc.	TX
11072	Truesdail Laboratories, Inc.	CA
6883	Tundra Air Consultants	MA
9238	TVA Environmental Chemistry	TN
9092	U.S.A.CHPPM DSA - S	GA
9327	UCAR Carbon Company, Inc.	OH
8182	UEC	PA
10692	Union Carbide Corporation	TX
10702	Union Carbide Corporation	TX
8985	Union Carbide Corporation	WV
10302	United Analytical Services	IL
18260	University of Iowa	IA
10033	University of Iowa	IA
11569	University of Washington	WA
8858	US Army Center for Health Prom. & Prev. Med.	MD
10842	US Department of Labor (OSHA)	UT
10760	USACHPPM - DSA-WEST	CO
16905	USPHS, FOH, NERL, DALLAS	TX
8917	Versar, Inc.	VA
8215	Volz Environmental Services, Inc.	PA
10407	Vulcan Chemicals	KS
6997	Warner-Lambert Company	NJ
10808	WASTREN - Grand Junction	CO
10080	Wausau Insurance Companies	WI
10070	West Allis Memorial Hospital	WI
10981	West Coast Analytical Service	CA
9063	Westinghouse Savannah River Co.	SC
10074	Wisconsin Occupational Health Laboratory	WI
11162	Zeneca Ag Products	CA
8187	Zinc Corporation of America	PA

ATTACHMENT 4

TABLE OF FREQUENTLY ENCOUNTERED CARCINOGENS

TABLE OF FREQUENTLY ENCOUNTERED CARCINOGENS

Carcinogen/ Regulations	OSHA Exposure Limits	Required Respirators	Monitoring		Required Postings	Health Hazards and Symptoms of Exposure
			Frequency	Employee Notification		
Arsenic/ 29 CFR 1910.1018	Action Level: 0.005 mg/m^3 PEL: 0.010 mg/m^3 IDLH: 5.0 mg/m^3 STEL: Not Established (NE)	Half-mask air purifying respirator equipped with HEPA filter or half-mask supplied air respirator. Fit-tests performed at least semi-annually. Quantitative fit-test required if >20 employees wear respirators and are exposed to arsenic.	Initial monitoring (IM) < action level (AL) on two consecutive occasions, discontinue monitoring. IM>PEL, monitor quarterly. AL<IM<PEL, monitor semi-annually.	Within five (5) working days after receipt of monitoring results.	DANGER INORGANIC ARSENIC CANCER HAZARD AUTHORIZED PERSONNEL ONLY NO SMOKING OR EATING RESPIRATOR REQUIRED	Exposure may cause lung cancer and can be a skin irritant. Inorganic arsenic is a poison which may affect the body if swallowed. Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin, [carcinogen]. Arsenic has been cited as a cause of skin cancer, but the incidence is low.
Benzene/ 29 CFR 1910.1028	Action Level: 0.005 mg/m^3 PEL: 0.010 mg/m^3 IDLH: 500.0 ppm STEL: 5.0 ppm	Half-mask air purifying respirator equipped with organic vapor cartridge. Qualitative or quantitative fit-test must be performed at least annually.	IM<AL, on two consecutive occasions, discontinue monitoring. AL≤IM≤PEL, monitor annually. IM>PEL, monitor semi-annually.	Within 15 working days after receipt of results.	DANGER BENZENE CANCER HAZARD FLAMMABLE - NO SMOKING AUTHORIZED PERSONNEL ONLY RESPIRATOR REQUIRED	Benzene can affect your health if you inhale it, or if it comes in contact with your skin or eyes. It is also harmful if you happen to swallow it. Repeated and prolonged exposure to benzene, even at relatively low levels, may result in various blood disorders, ranging from anemia to leukemia. Irritates eyes, skin, nose, and respiratory system; giddiness; headache, nausea, staggered gait; fatigue, anorexia, lassitude; dermatitis; bone marrow depression; [carcinogen].
Beryllium/ 29 CFR 1910.1000	Action Level: 0.001 mg/m^3 PEL: 0.002 mg/m^3 IDLH: 4.0 mg/m^3 STEL: NE	Half-mask air purifying respirator equipped with HEPA filter or half-mask supplied air respirator. Qualitative or quantitative fit-tests must be performed at least annually.	No monitoring schedule specified.	Not specified.	Not specified.	Harmful if inhaled or with skin contact. With chronic exposure Berylliosis; anorexia, low-weight, weakness, chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritates eyes; dermatitis; [carcinogen].

TABLE OF FREQUENTLY ENCOUNTERED CARCINOGENS (CONTINUED)

Carcinogen	OSHA Exposure Limits	Required PPE	Monitoring		Required Postings	Health Hazards and Symptoms of Exposure
			Frequency	Employee Notification		
Cadmium/ 29 CFR 1910.1027	Action Level: 0.0025 mg/m^3 PEL: 0.005 mg/m^3 IDLH: 9.0 mg/m^3 STEL: NE	Full facepiece air purifying respirator equipped with HEPA filter or a powered air-purifying respirator with a tight-fitting half mask equipped with a HEPA filter, or a supplied air respirator with a tight-fitting half mask operated in the continuous flow mode. Qualitative or quantitative fit-tests required at least annually for air-purifying respirators. Quantitative fit-tests required at least annually for supplied air respirators.	IM<AL, on two consecutive occasions, discontinue monitoring. IM>AL and >PEL, monitor semi-annually.	Within 15 working days after receipt of results.	DANGER CADMIUM CANCER HAZARD CAN CAUSE LUNG AND KIDNEY DISEASE AUTHORIZED PERSONNEL ONLY RESPIRATORS REQUIRED IN THIS AREA	Can cause local skin or eye irritation. Can affect your health if you inhale it or if you swallow it. Pulmonary edema, dyspnea, cough, chest tightness, substernal pain; headache; chills, muscular aches; nausea, vomiting, diarrhea; anosmia, emphysema, proteninuria, mild anemia; [carcinogen].
Formaldehyde/ 29 CFR 1910.1048	Action Level: 0.5 ppm PEL: 0.75 ppm IDLH: 20.0 ppm STEL: 2.0 ppm	Full facepiece air purifying respirator equipped with cartridges or canisters specifically approved for protection against formaldehyde. Qualitative or quantitative fit-tests required at least annually.	IM<AL and <STEL, on two consecutive occasions, discontinue mon-itoring. IM≥AL, mon-itor semi-annually. IM≥STEL, monitor annually.	Within 15 days of receiving results.	DANGER FORMALDEHYDE IRRITANT AND POTENTIAL CANCER HAZARD AUTHORIZED PERSONNEL ONLY	Health hazards associated with formaldehyde are primarily due to its toxic effects after inhalation, direct contact with the skin or eyes, or ingestion. Irritates eyes, nose throat, respiratory system; lacrimation; cough; bronchial spasms; [carcinogen].
Vinyl Chloride/ 29 CFR 1910.1017	Action Level: 0.5 ppm PEL: 1.0 ppm IDLH: NE STEL: NE	Any chemical cartridge respirator with an organic vapor cartridge which provides a service life of at least 1 hour for concentrations of vinyl chloride up to 10 ppm. Qualitative or quantitative fit-tests required at least annually.	IM<AL on two consecutive occasions, discontinue monitoring. IM>AL, monitor quarterly. IM>PEL, monitor monthly.	Within 10 working days of receiving results if the PEL is exceeded.	CANCER-SUSPECT AGENT AREA AUTHORIZED PERSONNEL ONLY	Harmful if inhaled or, in liquid form, with skin contact. Weakness; abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid can cause frostbite; [carcinogen].

ATTACHMENT 5

TABLE OF REQUIRED POSTINGS FOR CARCINOGENS

TABLE OF REQUIRED POSTINGS FOR CARCINOGENS

Carcinogen/ Regulations	REQUIRED POSTINGS		
	Entrances to Regulated Areas	**Areas containing hazardous operations or where an emergency currently exists**	**Containers**
Arsenic/ 29 CFR 1910.1018	DANGER INORGANIC ARSENIC CANCER HAZARD AUTHORIZED PERSONNEL ONLY NO SMOKING OR EATING RESPIRATOR REQUIRED	Not specified	All shipping and storage containers of inorganic arsenic and all products containing inorganic arsenic except when the inorganic arsenic is bound and not likely to result in an airborne exposure: DANGER CONTAINS INORGANIC ARSENIC CANCER HAZARD HARMFUL IF INHALED OR SWALLOWED USE ONLY WITH ADEQUATE VENTILATION OR RESPIRATORY PROTECTION
Benzene/ 29 CFR 1910.1028	DANGER BENZENE CANCER HAZARD FLAMMABLE - NO SMOKING AUTHORIZED PERSONNEL ONLY RESPIRATOR REQUIRED	Not specified	DANGER CONTAINS BENZENE CANCER HAZARD
Beryllium/ 29 CFR 1910.1000	Not specified	Not specified	Not specified
Cadmium/ 29 CFR 1910.1027	DANGER CADMIUM CANCER HAZARD CAN CAUSE LUNG AND KIDNEY DISEASE AUTHORIZED PERSONNEL ONLY RESPIRATORS REQUIRED IN THIS AREA	At all approaches to, and within, all regulated areas: DANGER CADMIUM CANCER HAZARD CAN CAUSE LUNG AND KIDNEY DISEASE AUTHORIZED PERSONNEL ONLY RESPIRATORS REQUIRED IN THIS AREA	Shipping and storage containers containing cadmium, cadmium compounds, or cadmium contaminated clothing, equipment, waste, scrap, or debris: DANGER CONTAINS CADMIUM CANCER HAZARD AVOID CREATING DUST CAN CAUSE LUNG AND KIDNEY DISEASE

TABLE OF REQUIRED POSTINGS FOR CARCINOGENS (CONTINUED)

Carcinogen/ Regulations	REQUIRED POSTINGS		
	Entrances to Regulated Areas	**Areas containing hazardous operations or where an emergency currently exists**	**Containers**
Formaldehyde/ 29 CFR 1910.1048	At entrances and accessways where exposure exceeds the TWA or STEL: DANGER FORMALDEHYDE IRRITANT AND POTENTIAL CANCER HAZARD AUTHORIZED PERSONNEL ONLY	Not specified	Containers for contaminated clothing and equipment and storage areas: DANGER FORMALDEHYDE-CONTAMINATED [CLOTHING] EQUIPMENT AVOID INHALATION AND SKIN CONTACT For materials capable of releasing formaldehyde at levels of 0.1 ppm to 0.5 ppm, identify that the product contains formaldehyde; list name and address of the responsible party; and state that physical and health hazard information is readily available from OEES and MSDSs. For materials capable of releasing >0.5 ppm, as above, and include respiratory sensitization and potential cancer hazard
Vinyl Chloride/ 29 CFR 1910.1017	CANCER-SUSPECT AGENT AREA AUTHORIZED PERSONNEL ONLY	CANCER-SUSPECT AGENT IN THIS AREA PROTECTIVE EQUIPMENT REQUIRED AUTHORIZED PERSONNEL ONLY	Polyvinyl Chloride (PVC) resin waste or other waste contaminated with vinyl chloride: CONTAMINATED WITH VINYL CHLORIDE CANCER-SUSPECT AGENT PVC: POLYVINYL CHLORIDE (OR TRADE NAME) CONTAINS VINYL CHLORIDE VINYL CHLORIDE IS A CANCER-SUSPECT AGENT Vinyl Chloride: EXTREMELY FLAMMABLE GAS UNDER PRESSURE CANCER SUSPECT AGENT or CANCER-SUSPECT AGENT

ATTACHMENT 6

SUPERVISOR'S REPORT OF INJURY OR ILLNESS

SUPERVISOR'S REPORT OF INJURY OR ILLNESS

NOTE In order to prevent accidents, it is necessary to know how and why they occur. State facts as accurately as possible. Accurate reporting of all facts will help in the preparation of the "Employer's Report." Submit your complete report within 24 hours to the appropriate HSM, Human Resources, your office HSC, and CHSD. If additional space is needed, use reverse side.

Name of Injured Employee		Department in Which Regularly Employed
Injury Date	Time a.m. p.m.	Date Employer Was Notified of Injury
Did Accident Occur on Employer's Premises? ☐ Yes ☐ No	Where? (Specify dept., job site, etc.)	Name of Witnesses

What was employee doing when injured? (walking, lifting, operating machines, etc.) Be specific.

Please describe fully the events that resulted in injury or occupational disease. Tell what happened and how it happened. (Do not describe nature of injury.)

What machine, tool, substance, or object was most closely connected with the injury? (e.g., machine the employee struck against or that struck him; the chemical that irritated his skin; in cases of strain, the thing he was lifting, pulling, etc.)

Nature of injury and part of body affected.

CAUSES OF ACCIDENT: CHECK ALL THAT APPLY

UNSAFE BUILDING OR WORKING CONDITIONS

- ☐ LAYOUT OF OPERATIONS
- ☐ LAYOUT OF MACHINERY
- ☐ UNSAFE PROCESSES
- ☐ IMPROPER VENTILATION
- ☐ IMPROPER SANITATION/HYGIENE
- ☐ IMPROPER LIGHT
- ☐ EXCESSIVE NOISE
- ☐ FLOORS OR PLATFORMS
- ☐ MISCELLANEOUS

HOUSEKEEPING

- ☐ IMPROPERLY PILED OR STORED MATERIAL
- ☐ CONGESTION

PHYSICAL HAZARDS OR EQUIPMENT

- ☐ INEFFECTIVELY GUARDED
- ☐ UNGUARDED
- ☐ GUARD REMOVED
- ☐ DEFECTIVE TOOLS
- ☐ DEFECTIVE MACHINES
- ☐ DEFECTIVE MATERIALS

INSTRUCTIONS AND TRAINING

- ☐ NONE
- ☐ INCOMPLETE
- ☐ ERRONEOUS
- ☐ NOT FOLLOWING INSTRUCTIONS
- ☐ OPERATING WITHOUT AUTHORITY
- ☐ WORKING AT UNSAFE SPEED
- ☐ INEXPERIENCE
- ☐ UNTRAINED IN PROCEDURE
- ☐ INCORRECT USE OF TOOL OR EQUIPMENT
- ☐ IMPROPER JUDGMENT
- ☐ IMPROPER LIFTING
- ☐ LIFTING EXCESSIVE WEIGHT

DISCIPLINE

- ☐ NOT FOLLOWING SAFETY RULES
- ☐ HORSEPLAY

APPAREL OR PERSONAL PROTECTIVE EQUIPMENT

- ☐ PROTECTIVE EQUIPMENT NOT USED
- ☐ UNSUITABLE PROTECTIVE EQUIPMENT
- ☐ UNSUITABLE CLOTHING OR FOOTWEAR

What can be done to prevent such an accident from happening again?

Approx. date condition will be corrected?	Signature of Supervisor:	Date:

OGDEN

ATTACHMENT 7

FIRST-AID INCIDENT REPORT

FIRST-AID INCIDENT REPORT

Date of Report:

Date of Injury/Incident:

Report Completed by:

Description of the Injury/Incident: (time, location, event, description of injuries)

Name of Injured Person:

Employer:

Name of First-aid Providers(s):

Social Security No.:

Bloodborne Pathogen Exposure Incident Evaluation:

1. Was the First-aid Responder exposed to blood or other potentially infectious materials?

☐ Exposure Occurred (see question 2)
☐ No Exposure

2. Exposure occurred by contact with the following (check all that apply):

☐ Eye
☐ Mouth
☐ Other Mucous Membrane
☐ Non-intact Skin (cuts, abrasions)
☐ Needlestick
☐ Human Bite

Exposure Control Precautions Taken (check all that apply):

☐ Gloves
☐ Face Mask
☐ One-way CPR valve
☐ Eye Protection
☐ Immediate Personal Hygiene
☐ Previous HBV Immunization
☐ Recommended for HBV Immunization
☐ Other ______________________

Please attach this completed form with the Supervisor's Report of Injury or Illness, and the Accident/First-aid Incident Summary Log, and forward to the appropriate HSM, Human Resources, your Office HSC, and CHSD.

OGDEN

ATTACHMENT 8

ACCIDENT/FIRST-AID INCIDENT SUMMARY LOG

OGDEN

Period Covered: ______________________

Location: ______________________

ACCIDENT / FIRST-AID INCIDENT SUMMARY LOG

Date/Time	Employee Name	Ogden Location/ Project	General[1] Description	First-Aid[2] Provided?	Medical Attention?	Comments	Universal Precautions Taken?
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							
11.							

---

[1] Attach completed Supervisor's Report of Injury or Illness

[2] Attach completed First-Aid Incident Report

ATTACHMENT 9

RECORD OF MEETING FORM

OGDEN

RECORD OF MEETING

DATE:	LENGTH OF MEETING (HRS.):

PROJECT (ATTACH OUTLINE/AGENDA IF APPLICABLE):

CHAIRPERSON:	DIVISION:	REFERENCES:
TYPE OF PRESENTATION:	VISUAL AIDS USED:	

NOTE: NAMES/SIGNATURES BELOW ACKNOWLEDGE ATTENDANCE

NAME (PRINT OR TYPE)	SIGNATURE	DIVISION	DATE

Health & Safety/Forms/Record of Meeting

OGDEN ENVIRONMENTAL AND ENERGY SERVICES

STANDARD OPERATING PROCEDU

S.O.P. NO. H-5	PAGE 1 OF
EFFECTIVE DATE 10/1/96	REVISION NO. 0
APPROVAL Denise L. Daggett, CIH	

TITLE

SAMPLING EQUIPMENT, HEAVY EQUIPMENT, AND VEHICLE DECONTAMINATION

1.0 PURPOSE

The purpose of this procedure is to provide standard decontamination methods for use during project activities at sites potentially contaminated with hazardous materials/ wastes. The removal of waste-laden materials and surface contamination from sampling and heavy equipment, and vehicles is necessary because, once complete, it permits unrestricted use of the equipment by OEES and subcontractors, full movement of the equipment in the clean areas of the site, and for relocation offsite. An additional benefit is that once decontamination is complete, only the need for basic safety equipment remains (e.g., safety boots, hard hat, and safety glasses).

There are chemical and physical hazards associated with decontamination activities. The purpose of this SOP is to establish procedures that will ensure personnel safety during the decontamination process. Personnel decontamination is addressed in SOP H-6, *Personnel Decontamination*.

2.0 SCOPE

This procedure applies to all OEES employees and subcontractors where applicable during decontamination of sampling and heavy equipment, and vehicles, as delineated in site-specific Health and Safety Plans (HSPs).

Deconnable surfaces are nonporous surfaces incapable of absorbing contaminants. Deconnable surfaces include metal, glass, and high density plastics or polymers.

3.0 DEFINITIONS

Decontamination - Decontamination is defined as the process of physically removing contaminants or changing their chemical nature to innocuous substances.

Exclusion/Hot Zone - The Exclusion or Hot Zone (EZ) is defined as the area where contamination is the greatest. It encompasses a 30-foot radius around intrusive activities with access restricted to field sampling crews and necessary equipment operators.

Transition Zone - The Transition Zone (TZ) is defined as the area between the EZ and Contamination Reduction Zone (CRZ). It should be established upwind of the EZ and serve as the support area for sample quality assurance/quality control (QA/QC) and packing. Any coolers that are in this zone should be protected from contamination using polyethylene sheeting and decontaminated prior to leaving the site.

Contamination Reduction Zone - The CRZ is defined as the area between the TZ and the Clean or Support Zone (SZ). Consisting of two separate decontamination lines, this is the area where both equipment and personnel are "cleaned" in order to prevent the spread of contamination. The CRZ should be marked as narrow corridors through which personnel and equipment pass from work zones to the SZ.

Clean/Support Zone - The SZ is defined as the area of contamination. It is upwind and away from the EZ and serves as the location where vehicles, emergency equipment, telephones, break areas, and all non-essential personnel remain.

4.0 RESPONSIBILITIES

4.1 PROJECT MANAGER (PM)

The PM is responsible for identifying instances of non-compliance with this procedure and ensuring that future field activities are in compliance with this procedure.

4.2 FIELD MANAGER (FM)

The FM will ensure that this procedure is implemented correctly. The FM will also ensure that decontamination effectiveness is evaluated, as necessary.

4.3 SITE HEALTH AND SAFETY COORDINATOR (SHSC)

The SHSC is responsible for ensuring that decontamination occurs according to this procedure.

4.4 HEALTH AND SAFETY MANAGER (HSM)

The HSM is responsible for ensuring that this procedure reflects the current scientific practices in the area of equipment and vehicle decontamination.

5.0 PROCEDURES

Before any work begins on a hazardous waste site, a decontamination plan should be developed and set up. The plan should:

- determine the number and layout of decontamination stations
- determine the decontamination equipment and solutions needed
- determine appropriate decontamination methods
- establish procedures to prevent contamination of clean areas
- establish methods and procedures to minimize worker contact with contaminants during decontamination

The plan should be revised whenever the site conditions change or the site hazards are reassessed based on new information.

The following subsections describe standards for decontamination.

5.1 EQUIPMENT AND VEHICLE DECONTAMINATION AREA

An appropriate location for sampling and heavy equipment and vehicle decontamination at a site shall be selected based on the ability to control access to the area, control residual material removed from equipment, store clean equipment, and gain entry and exit for vehicles. The decontamination area shall be located at an adequate distance away and upwind from potential contaminant sources to avoid contamination of clean areas and personnel (usually in the CRZ), and separate from the personnel decontamination area. Once equipment and vehicles are clean, they shall be moved to a clean area or stay at a sufficient distance from the potential contamination sources and the decontamination area to ensure that they remain clean. Work zones are shown on Attachment 1.

5.2 CLEANING SOLUTIONS, EQUIPMENT, AND TECHNIQUES

The preferred method of sampling equipment decontamination involves the use of long-handled, soft-bristled brushes, galvanized wash tubs or equivalent with secondary containment, pump-activated sprayer, buckets with plastic liners and drums with liners, visqueen, a mild detergent solution, and an appropriate solvent (usually isopropyl alcohol) in a spray bottle. Lumber and/or coolers/crates/boxes are preferred for elevating sampling equipment decon buckets. Detergents are preferred over other cleaning solutions because the detergent alone does not pose a handling or disposal problem (see Attachment 2). The more commonly used solutions are Penetone 155, in cases where polychlorinated biphenyls (PCBs) are of concern, and Liquinox or Alconox for general decontamination purposes. Material Safety Data Sheets (MSDSs) for decon solutions must be appended to the site-specific Health and Safety Plan (HSP).

Equipment and vehicle decontamination is accomplished using a variety of equipment, techniques, and solutions. A list of the necessary decontamination supplies for equipment and vehicles is as follows:

- PPE (see below)

- high-pressure water sprayer: for washing and rinsing heavy equipment and vehicles (or equivalent decon fluid delivery device), or pressurized pump spray canister for final rinse of sampling equipment

- hazard tape (black and yellow) for marking heavy equipment and vehicles before release

- appropriate decon solution (water, dilute acids or bases, detergent-based surfactants, organic solvents)

- appropriate rinse solution (usually water)

- curtains, enclosures, or spray booth to contain splashes and blow back from high-pressured sprayers for heavy equipment and vehicle decontamination: visqueen plastic sheets or rolls, lumber

- containment to hold contaminants and solutions: Assorted booms, lumber, duct tape (for temporary containment)

- assorted rags, long-handled brushes, shovels, hand tools, buckets (for exterior and cab decon, and submersion of sampling equipment)

- storage tanks or drums for appropriate treatment systems to provide temporary storage and/or treatment of contaminated wash and rinse solutions

- drains or pumps for collection of contaminated wash and rinse solutions

- containers for storage and disposal of contaminated wash and rinse solutions, damaged or heavily contaminated parts, and porous, non-deconnable materials to be discarded

Attachment 3 shows the preferred setup for the sampling equipment decontamination area and the heavy equipment decon area.

5.3 Personal Protective Equipment (PPE)

Generally Level Modified D or C PPE will be required for those personnel performing decontamination. The level of PPE for decon is stated in the HSP and is typically equivalent to or slightly less than the PPE required by personnel who enter the EZ. The SHSC will require upgrading or permit downgrading when evidence allows the determination of airborne or surface contamination. This upgrade or downgrade will be determined by the SHSC through visual inspection and/or air monitoring for the contaminant of concern. The SHSC will inform the decon staff when it is acceptable to downgrade the PPE.

The HSP will identify the proper canister for use with Level C respiratory protection based upon the contaminants known or suspected to occur at the site.

5.4 Sampling Equipment Decontamination Procedure

1. Assemble the appropriate decon equipment and PPE for use during your shift.

2. Prepare the appropriate decon wash and rinse solution(s) for use. This may consist of diluting an acid, base, surfactant, or detergent to a suitable concentration. Be sure to refer to the applicable MSDS, if available before commencing.

3. Carefully remove AS MUCH contaminated material AS POSSIBLE manually using shovels, rods, trowels, brushes, etc., from the exterior and interior of the equipment to be deconned, allowing the material to fall onto a visqueen-coated surface or into an empty bucket.

4. Immerse the equipment in the first decon bucket containing the decon solution. The fluids must be contained by secondary buckets containing the decon buckets (temporary or permanent). Tenting may have to be utilized in order to prevent the blowing of contaminant-laden droplets into a clean area.

5. Immerse the entire piece of sampling equipment in the appropriate rinse solution in the second bucket.

6. Spray the piece of equipment with the solvent.

7. Place the equipment in the third bucket for the final rinse.

8. Follow with a spray of deionized water from a pressurized sprayer.

9. Dispose of all non-deconnable materials in a suitable manner. This may consist of placing the materials in appropriate containers or moving the materials to a designated portion of the waste feed pile for eventual treatment and/or incineration.

NOTE: In some instances it may be necessary to use an additional wash/soap solution bucket before equipment is sent through the decon line.

5.5 HEAVY EQUIPMENT OR VEHICLE DECONTAMINATION PROCEDURE

1. Assemble the appropriate decon equipment and PPE for use during your shift.

2. Prepare the appropriate decon wash and rinse solution(s) for use. Decon solutions may include water, dilute acids or bases, surfactants, or detergents. Be sure to refer to the applicable MSDS, if available before commencing.

3. Drive the vehicle onto or place the heavy equipment on the decontamination pad.

4. Carefully remove AS MUCH contaminated material AS POSSIBLE manually using shovels, rods, trowels, brushes, etc., from the exterior and interior of the equipment to be deconned, including the cabs of vehicles.

5. Using a high-pressure sprayer or other equivalent liquid delivery device, carefully wet down the vehicle or heavy equipment with the appropriate decon solution. Care should be taken to remove as much visible contamination as possible utilizing the minimal amount of liquids. The fluids must be contained by berms (temporary or permanent). Plastic sheeting may have to be erected in order to prevent the blowing of contaminant-laden droplets into a clean area. The decon washings must drain into a collection device (grate with sump or holding tank).

6. If deconning a vehicle, pull the vehicle slightly forward and decon the part of the tire that was in contact with the ground that had not been previously deconned. Wash the contaminated material away from the deconned vehicle so as not to recontaminate.

7. Rinse the entire vehicle or piece of heavy equipment with the appropriate rinse solution, as necessary.

8. Mark the deconned vehicle or heavy equipment with Hazard Tape (black and yellow stripe) or use a Decon Inspection Ticket (Attachment 4). This will signify to the SHSC which equipment needs to be released.

9. Contact the SHSC for release. The SHSC may release by visual inspection (in event of low health hazard) or by wipe testing (in event of moderate to high health hazard). The SHSC will remove the Hazard Tape or sign off on the

2. Prepare the appropriate decon wash and rinse solution(s) for use. Decon solutions may include water, dilute acids or bases, surfactants, or detergents. Be sure to refer to the applicable MSDS, if available before commencing.

3. Drive the vehicle onto or place the heavy equipment on the decontamination pad.

4. Carefully remove AS MUCH contaminated material AS POSSIBLE manually using shovels, rods, trowels, brushes, etc., from the exterior and interior of the equipment to be deconned, including the cabs of vehicles.

5. Using a high-pressure sprayer or other equivalent liquid delivery device, carefully wet down the vehicle or heavy equipment with the appropriate decon solution. Care should be taken to remove as much visible contamination as possible utilizing the minimal amount of liquids. The fluids must be contained by berms (temporary or permanent). Plastic sheeting may have to be erected in order to prevent the blowing of contaminant-laden droplets into a clean area. The decon washings must drain into a collection device (grate with sump or holding tank).

6. If deconning a vehicle, pull the vehicle slightly forward and decon the part of the tire that was in contact with the ground that had not been previously deconned. Wash the contaminated material away from the deconned vehicle so as not to recontaminate.

7. Rinse the entire vehicle or piece of heavy equipment with the appropriate rinse solution, as necessary.

8. Mark the deconned vehicle or heavy equipment with Hazard Tape (black and yellow stripe) or use a Decon Inspection Ticket (Attachment 4). This will signify to the SHSC which equipment needs to be released.

9. Contact the SHSC for release. The SHSC may release by visual inspection (in event of low health hazard) or by wipe testing (in event of moderate to high health hazard). The SHSC will remove the Hazard Tape or sign off on the

Decon Inspection Ticket (Attachment 4) when the vehicle or equipment is released.

10. Dispose of all non-deconnable materials in a suitable manner. This may consist of placing the materials in appropriate containers or moving the materials to a designated portion of the waste feed pile for eventual treatment and/or incineration.

5.6 CONTROLS FOR CHEMICAL AND PHYSICAL HAZARDS

The following standard practices will help to control the physical and chemical hazards of the decon procedure:

- elevate sample buckets to prevent back strain due to bending and stooping
- perform decontamination with steady motions that utilize the natural angle of the body's wrists, fingers, hands, arms, neck, and back
- use hand-powered pump spray devices rather than triggered spray bottles
- transport drums on a drum dolly to the location of the decon wastewater (buckets or bermed pad) rather than carry buckets to the drum storage area for disposal of wastewater, or place lids on the buckets and move the buckets by an appropriate method
- rotate personnel on job tasks to minimize the effects of heat exposure and ergonomic trauma
- wear appropriate PPE (as specified in the HSP), such as gloves, Tyvek®, and safety glasses to protect from chemical exposure during decon
- stand upwind of the spray stream of solvent to avoid inhalation and skin contact
- stand upwind of the decon line or the equipment being deconned to avoid being splashed by liquid spray that may contain contaminated materials

- stand upwind of the decon line or the equipment being deconned to avoid being splashed by liquid spray that may contain contaminated materials

5.7 EFFICIENCY TESTING

The SHSC will evaluate all decontamination activities for completeness. This may consist of visual inspections, decon solution analysis (i.e.: for pH), or surface wipe testing if the contaminant can be detected in this manner. With a standard wipe test, a standard-size template (usually 10 cm X 10 cm) is used to delineate the area to be wipe tested. The wiping media generally consists of glass wool (or equivalent) and a suitable solvent. At the completion of the test the sampling media is placed carefully into a glass vial, sealed, marked, and submitted for analysis. The SHSC will receive the wipe test analytical data from the analytical laboratory.

5.8 RELEASE CRITERIA

All wipe test results will be reviewed by the SHSC for comparison to a recognized standard. This standard may be derived from regulatory dictates (i.e.: EPA and PCBs), agency recommendations (i.e.: Dept. of Health Services and total hydrocarbons), or from good industrial practices (i.e.: pH between 6 and 8, visually clean).

At the time of release the SHSC will remove the Hazard Tape or Decon Inspection Ticket (Attachment 4) signifying that the released vehicle or equipment is fully decontaminated and available for uncontrolled movement and usage.

6.0 REFERENCES

NIOSH/OSHA/USCG/EPA. 1985. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities. October.

7.0 ATTACHMENTS

1. Work Zones
2. Suggested Decontamination Solutions
3. Sampling and Heavy Equipment Decontamination Setup
4. Decon Inspection Ticket

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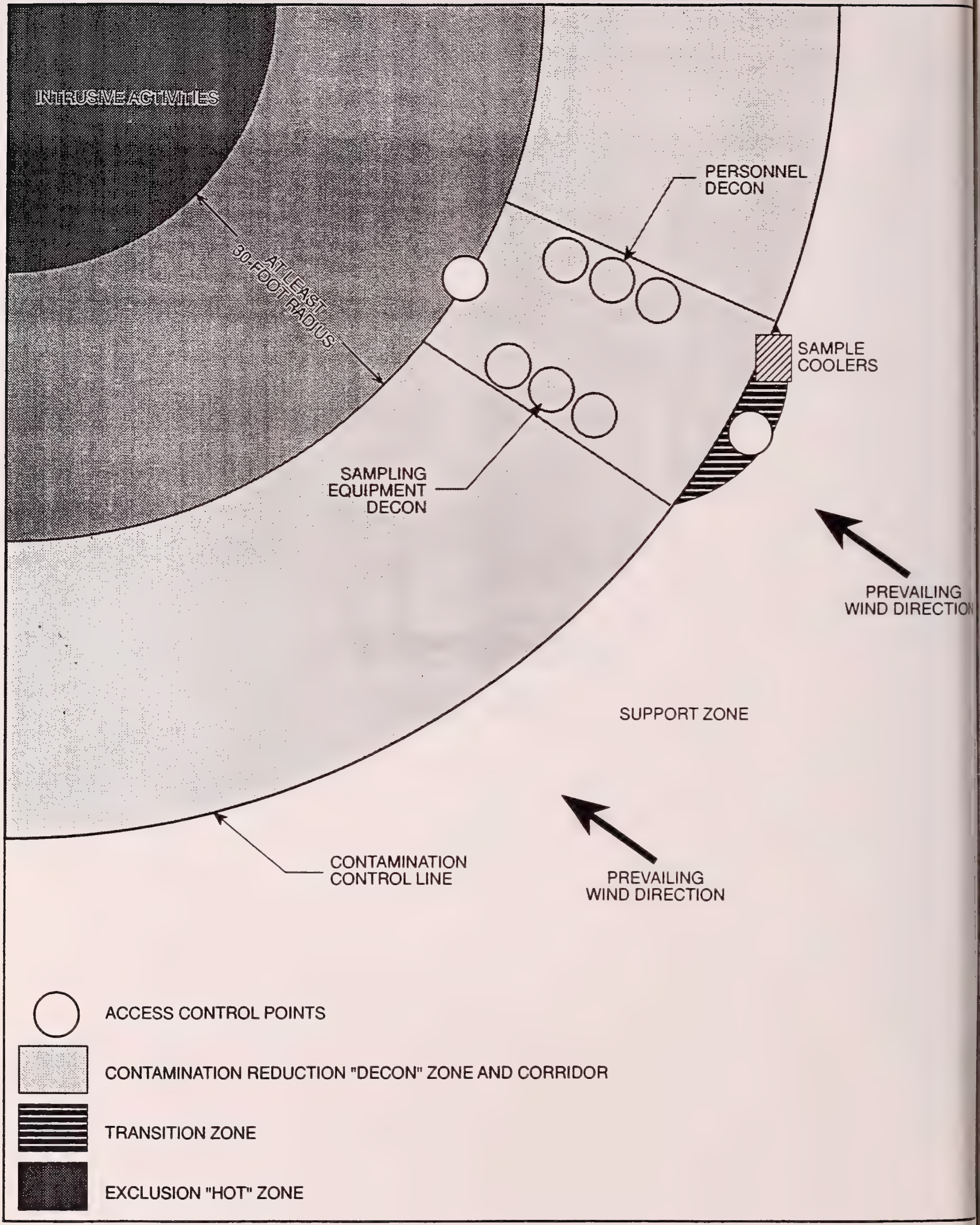
ATTACHMENT 1

WORK ZONES



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Work Zones

ATTACHMENT 2

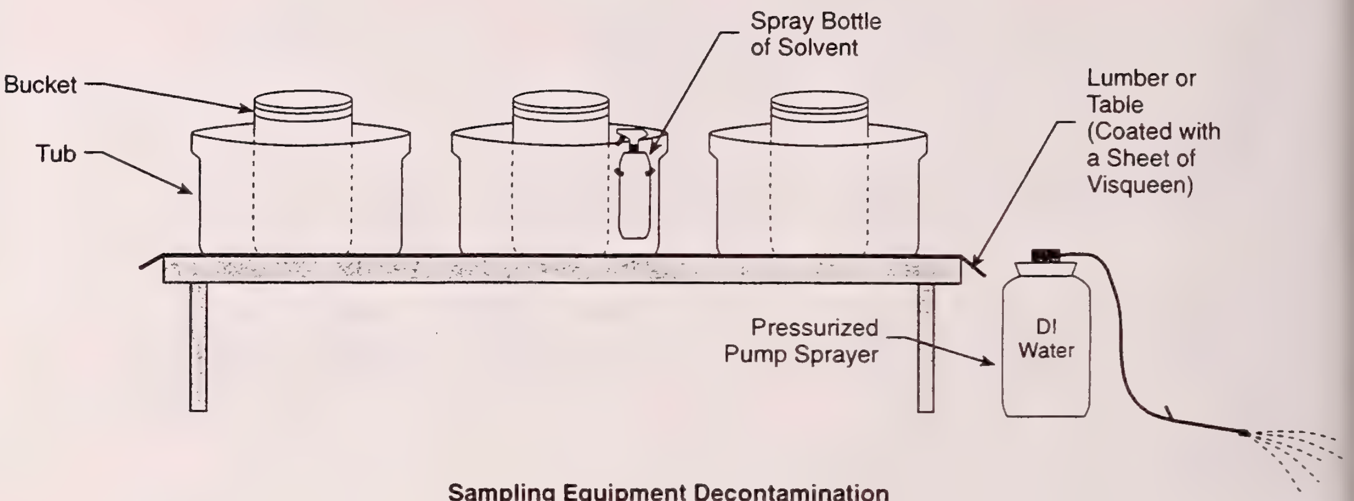
SUGGESTED DECONTAMINATION SOLUTIONS

SUGGESTED DECONTAMINATION SOLUTIONS

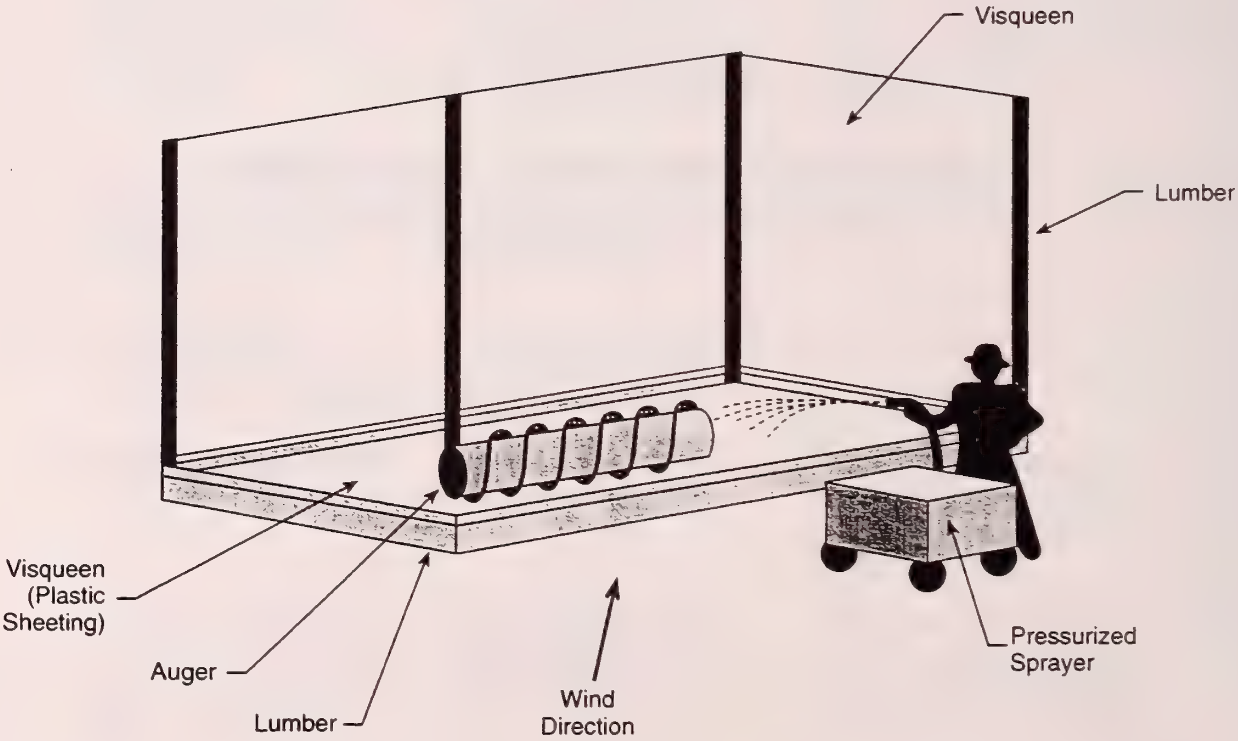
	Decon Solution	Mixing	Uses/Remarks
A.	An aqueous solution containing a low-sudsing detergent. Ex: Alconox, Penetone 155, Liquinox.	Follow the mixing instructions written on the particular product label.	Generally has the widest range of use. Best choice on sites where contaminants exist.
B.	An aqueous solution containing 5% sodium carbonate (Na_2CO_3) washing soda.	To ten gallons of water, add four pounds of sodium carbonate.	Decon solution of choice for base labile compounds such as the organophosphate pesticides. Effective in neutralizing inorganic acids. Since sodium carbonate is a water softening agent, this characteristic is an aid in physical removal of contaminants.
C.	An aqueous solution containing 5% sodium bicarbonate ($NaHCO_3$) baking soda.	To ten gallons of water, add four pounds of sodium bicarbonate.	Sodium bicarbonate can be used to neutralize either base or acid contaminants. Good decon for base labile compounds.
D.	An aqueous solution containing 2% trisodium phosphate (Na_3PO_4) TSP.	To ten gallons of water, add two pounds of trisodium phosphate.	See uses/remarks for Decon Solution B above.
E.	An aqueous solution containing 10% calcium hypochlorite ($CaCl_2O_3$).	To ten gallons of water, add eight pounds of calcium hypochlorite.	Cyanide salts.
F.	Ethylenediaminete-tetra-acetic acid (EDTA).	Commercial product, follow product label.	EDTA is a chelating agent and is the decon solution of choice for heavy metal contaminants.
G.	An aqueous solution containing 3-5% citric, tartaric, oxalic acids, or their respective sodium salts.	To ten gallons of water, add four pounds of citric, tartaric, or oxalic acid.	These compounds are chelating agents and are a decon solution of choice for heavy metal contaminants.

ATTACHMENT 3

SAMPLING AND HEAVY EQUIPMENT DECONTAMINATION SETUP



Sampling Equipment Decontamination



Heavy Equipment Decontamination

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Sampling and Heavy Equipment Decontamination Setup

ATTACHMENT 4

DECON INSPECTION TICKET

NOTICE

Decon Inspection Ticket

Equipment Description: ______________

____

____

Date Deconned: ________________

By: ___________________________

Date Released: ________________

By: ___________________________

OGDEN

OGDEN ENVIRONMENTAL AND ENERGY SERVICES

STANDARD OPERATING PROCEDURE

S.O.P. NO. H-6	PAGE 1 OF 10
EFFECTIVE DATE 10/1/96	REVISION NO. 0
APPROVAL Denise L. Daggett, CIH	

TITLE

PERSONNEL DECONTAMINATION

1.0 PURPOSE

The purpose of this procedure is to provide standard personnel decontamination methods for use during site activities at sites potentially contaminated with hazardous materials/ wastes. In general, decontamination protects workers from hazardous substances that may contaminate and eventually permeate protective clothing, respiratory equipment, tools, vehicles, and other equipment used onsite; protects all site personnel by minimizing the transfer of harmful materials into clean areas; helps prevent mixing of incompatible chemicals; and protects the community by preventing uncontrolled transportation of contaminants from the site. If garments which have come in contact with contaminants are not removed carefully and/or decontaminated, an unexpected exposure may result.

2.0 SCOPE

This procedure applies to all OEES employees and subcontractors where applicable during decontamination of field personnel contacting possible contaminants, as delineated in site-specific Health and Safety Plans (HSPs). Levels of protection discussed in this SOP are defined in SOP H-12, *Personal Protective Equipment*. Sampling equipment, heavy equipment, and vehicle decontamination are discussed in SOP H-5, *Sampling Equipment, Heavy Equipment, and Vehicle Decontamination*.

3.0 DEFINITIONS

Decontamination - Decontamination is defined as the process of physically removing contaminants or changing their chemical nature to innocuous substances.

Hot/Exclusion Zone - The Hot or Exclusion Zone (EZ) is defined as the area where contamination is the greatest. It encompasses a 30-foot radius around intrusive activities with access restricted to field sampling crews and necessary equipment operators.

Transition Zone - The Transition Zone (TZ) is defined as the area between the Support Zone and Contamination Reduction Zone (CRZ). It should be established upwind of the EZ and serve as the support area for sample quality assurance/quality control (QA/QC) and packing. Any coolers that are in this zone should be protected from contamination using polyethylene sheeting and decontaminated prior to leaving the site.

Contamination Reduction Zone - The CRZ is defined as the area between the TZ and the Clean or Support Zone (SZ). Consisting of two separate decontamination lines, this is the area where both equipment and personnel are "cleaned" in order to prevent the spread of contamination. The CRZ should be marked as narrow corridors through which personnel and equipment pass from work zones to the SZ.

Clean/Support Zone - The SZ is defined as the area of no contamination. It is upwind and away from the EZ and serves as the location where vehicles, emergency equipment, telephones, break areas, and all non-essential personnel remain.

4.0 RESPONSIBILITIES

4.1 PROJECT MANAGER (PM)

The PM is responsible for identifying instances of non-compliance with this procedure and ensuring that future field activities are in compliance with this procedure.

4.2 FIELD MANAGER (FM)/EMERGENCY COORDINATOR (EC)

The FM/EC will ensure that this procedure is implemented correctly. The FM will also ensure that decontamination effectiveness is evaluated, as necessary.

4.3 SITE HEALTH AND SAFETY COORDINATOR (SHSC)

The SHSC is responsible for ensuring that all personnel are decontaminated according to this procedure.

4.4 HEALTH AND SAFETY MANAGER (HSM)

The HSM is responsible for ensuring that this procedure reflects the current scientific practices in the area of personnel decontamination.

5.0 PROCEDURES

The extensiveness of decontamination depends on a number of factors, the most important being the type of contaminants involved. The more harmful the contaminant, the more extensive and thorough decontamination must be. Before any work begins on a hazardous waste site, a decontamination plan should be developed and set up. The plan should:

- determine the number and layout of decontamination stations
- determine the decontamination equipment and solutions needed
- determine appropriate decontamination methods
- establish procedures to prevent contamination of clean areas
- establish methods and procedures to minimize worker contact with contaminants during removal of personal protective clothing and equipment (PPE)
- establish methods for disposing of clothing and equipment that are not completely decontaminated

The plan should be revised whenever the type of PPE changes, the site conditions change, or the site hazards are reassessed based on new information.

The following subsections describe standards for decontamination. The techniques to be used based on the level of protection, frequency of decontamination, and cleaning solutions are among the standards addressed.

5.1 PERSONNEL DECONTAMINATION AREA

An appropriate location for the personnel decontamination area at a site shall be selected based on the ability to control access to the area, control residual material removed from clothing, and store clean clothing. The decontamination area shall be located at an adequate distance away and upwind from potential contaminant sources to avoid contamination of clean areas and personnel (usually in the CRZ), and separate from the equipment decontamination area. Once personnel are clean, they shall stay at a sufficient distance from the potential contamination sources and the decontamination area to ensure that they remain clean. Work zones are shown on Attachment 1.

5.2 CLEANING SOLUTIONS, EQUIPMENT, AND TECHNIQUES

Personnel decontamination can be accomplished using a variety of equipment, techniques, and solutions. The preferred method of personnel decontamination involves the use of long-handled, soft-bristled brushes, galvanized wash tubs or equivalent, pump-activated sprayer, garbage cans with plastic liners and drums with liners, visqueen, paper towels, duct tape, and a mild detergent solution. Detergents are preferred over other cleaning solutions because the detergent alone does not pose a handling or disposal problem (see Attachment 2 for suggested detergents). The more commonly used solutions are Penetone 155, in cases where polychlorinated biphenyls (PCBs) are of concern, and Liquinox, Alconox, or Simple Green for general decontamination purposes. Material Safety Data Sheets (MSDSs) for decontamination solutions used onsite shall be appended to the HSPs.

5.3 LEVEL A & B DECONTAMINATION

The intermediate and final stage personnel decontamination procedures for Level A and B include the following:

1. segregated equipment drop just outside the hotline on plastic sheets (for instruments and equipment requiring special decontamination as outlined in the Quality Assurance Plan, work plan, or field sampling plan)

2. outer boot and glove wash with long-handled, soft-bristled brushes and decontamination/detergent solution

3. outer boot and glove rinse with water

4. outer boot removal

5. outer glove removal

6. protective suit wash with long-handled, soft-bristled brushes in decontamination/detergent solution, as applicable to the contaminant(s)

7. protective suit rinse with water, as applicable to the contaminant(s)

8. (Optional.) Tank change: the self-contained breathing apparatus (SCBA) tank is exchanged for a full one; worker receives new outer gloves and boots, which are sealed with new tape, and returns to the EZ

9. removal of safety boots in designated receptacles, as applicable

10. removal and storage of SCBA backpack on a table; facepiece must remain on

11. removal and storage, on racks or plastic sheeting, of protective suit and hardhat with the assistance of a helper

12. inner glove wash with decontamination/detergent solution

13. inner glove rinse with water

14. removal and storage of facepiece in a lined container for subsequent decontamination; the fingers should not touch the face

15. removal and disposal of inner gloves in designated receptacles

16. complete body shower if severe conditions at the site exist; otherwise, hand and face wash

17. personnel redress and enter the SZ

5.4 LEVEL C DECONTAMINATION (SEE ATTACHMENT 3)

The intermediate and final stage personnel decontamination procedures consist of the following for Level C:

1. segregated equipment drop just outside the hotline on plastic sheets (for instruments and equipment requiring special decontamination as outlined in the quality assurance portion of the project documents)

2. outer boot and glove wash with long-handled, soft-bristled brushes and decontamination/detergent solution

3. outer boot and glove rinse with water

4. removal of duct tape using pull tabs

5. (Optional.) Sample management: removal of outer glove and storage for later use; enter TZ for sample management, return to EZ wearing new or cleaned outer gloves

6. removal or disposal of outer boots in designated receptacles

7. removal and disposal (if not cleaned to "like new" condition) of outer gloves in designated receptacles

8. removal and disposal of coverall in designated receptacles

9. inner glove wash

10. inner glove rinse

11. removal of respirator

12. removal and disposal of inner gloves in designated receptacles

13. enter the SZ

14. general field wash for personal hygiene

5.5 LEVEL MODIFIED D DECONTAMINATION (SEE ATTACHMENT 4)

The intermediate and final stage personnel decontamination procedures consist of the following for Level Modified D:

1. segregated equipment drop just outside the hotline on plastic sheets (for instruments and equipment requiring special decontamination as outlined in the Quality Assurance Plan, work plan, or field sampling plan)

2. outer boot and glove wash with long-handled, soft-bristled brushes and decontamination/detergent solution

3. outer boot and glove rinse with water

4. removal of duct tape using pull tabs (if applicable)

5. (Optional.) Sample management: removal of outer glove and storage for later use; enter TZ for sample management, return to EZ wearing new or cleaned outer gloves

6. removal or disposal of outer boots in designated receptacles

7. removal and disposal (if not cleaned to "like new" condition) of outer gloves in designated receptacles

8. removal and disposal of coverall in designated receptacles

9. inner glove wash

10. inner glove rinse

11. removal and disposal of inner gloves in designated receptacles

12. enter the SZ

13. general field wash for personal hygiene

5.6 LEVEL D DECONTAMINATION

Typically, Level D does not require decontamination of protective gear. However, if chemically-protective gloves are used in the course of Level D work, the gloves must be rinsed, carefully removed, and disposed of properly.

5.7 METHODS FOR DETERMINING THE EFFECTIVENESS OF DECONTAMINATION

Decontamination methods vary in their effectiveness for removing different substances. The effectiveness of any decontamination method should be assessed at the beginning of a program and periodically throughout the lifetime of the program by the SHSC or site individual responsible for QA/QC. If evidence indicates that decontamination has been ineffective, then the decontamination program must be revised. The following methods may be useful in assessing the effectiveness of decontamination. Visual observation is the most common method.

5.7.1 Visual Observation

When there is no reliable test to immediately determine the effectiveness of decontamination, visual observation will be used. Physical alterations such as discoloration, stains, corrosive effects, visible dirt, or changes in clothing fabric may indicate that contaminants have not been removed. If through visual observation decontamination has been determined to be ineffective, the decontamination steps must be repeated. Not all contaminants leave visible traces and many contaminants can permeate clothing and not be easily seen.

5.7.2 Wipe Sampling

Wipe testing provides after-the-fact information on the effectiveness of decontamination. This technique can be used on clothing, equipment, and the skin of personnel. In this procedure, a dry or wet cloth, glass fiber paper, or swab is wiped over the surface of the potentially contaminated object or person and then analyzed in a laboratory. In the case of reusable clothing, both the inner and outer surfaces should be tested.

5.7.3 Rinsate Analysis

Another way to test the effectiveness of decontamination procedures is to analyze for contaminants in a rinsate container. Elevated levels of contaminants are an indication that additional cleaning and rinsing are needed.

5.8 DISPOSAL

All equipment, spent solutions, and wash/rinse waters must be decontaminated and/or disposed of properly. Buckets, brushes, clothing, and other contaminated materials should be collected, placed in containers, and labeled until final disposition is determined. Spent solutions and wash/rinse waters must be collected and stored in properly labeled Department of Transportation (DOT)-approved containers. Labels should clearly indicate container contents, source, location, activity, and generator.

5.9 EMERGENCY DECONTAMINATION

In the event of a non-life-threatening injury in the EZ requiring first aid, the injured party should be evacuated to the decontamination line and decontaminated as much as possible or practical. Contaminated clothing should be removed.

If a serious injury is sustained, life-saving care shall be administered immediately without regard to decontamination. Outside garments should be removed if it does not cause delays, interfere with treatment, or aggravate the problem. If the outer garments cannot be safely removed, the individual should be wrapped in a blanket or plastic prior to transport to a medical facility. No attempt should be made to wash or rinse the individual at the site, unless they are contaminated with an extremely toxic or corrosive material which could cause severe injury or loss of life to themselves or assisting personnel. The EC will notify the responding emergency medical personnel of the nature of the contaminants and the extent of decontamination, if any, which was accomplished.

6.0 REFERENCES

NIOSH/OSHA/USCG/EPA. 1985. *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*. October.

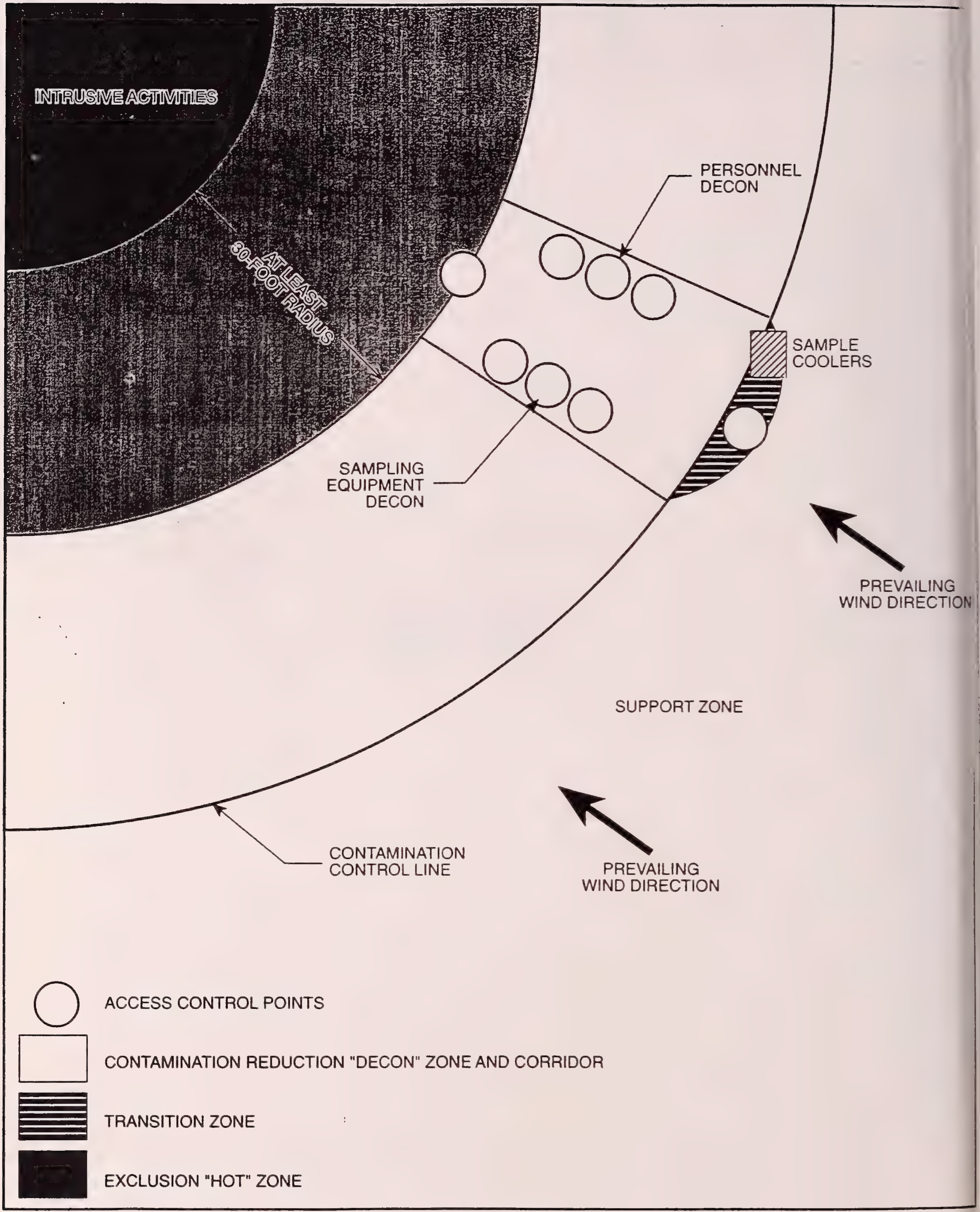
EPA. *1988 Standard Operating Safety Guides*. July.

7.0 ATTACHMENTS

1. Work Zones
2. Suggested Decontamination Solutions
3. Level C Decon
4. Level Modified D Decon

ATTACHMENT 1

WORK ZONES


INTRUSIVE ACTIVITIES
AT LEAST 30-FOOT RADIUS
PERSONNEL DECON
SAMPLE COOLERS
SAMPLING EQUIPMENT DECON
PREVAILING WIND DIRECTION
SUPPORT ZONE
CONTAMINATION CONTROL LINE
PREVAILING WIND DIRECTION
ACCESS CONTROL POINTS
CONTAMINATION REDUCTION "DECON" ZONE AND CORRIDOR
TRANSITION ZONE
EXCLUSION "HOT" ZONE

Work Zones

ATTACHMENT 2

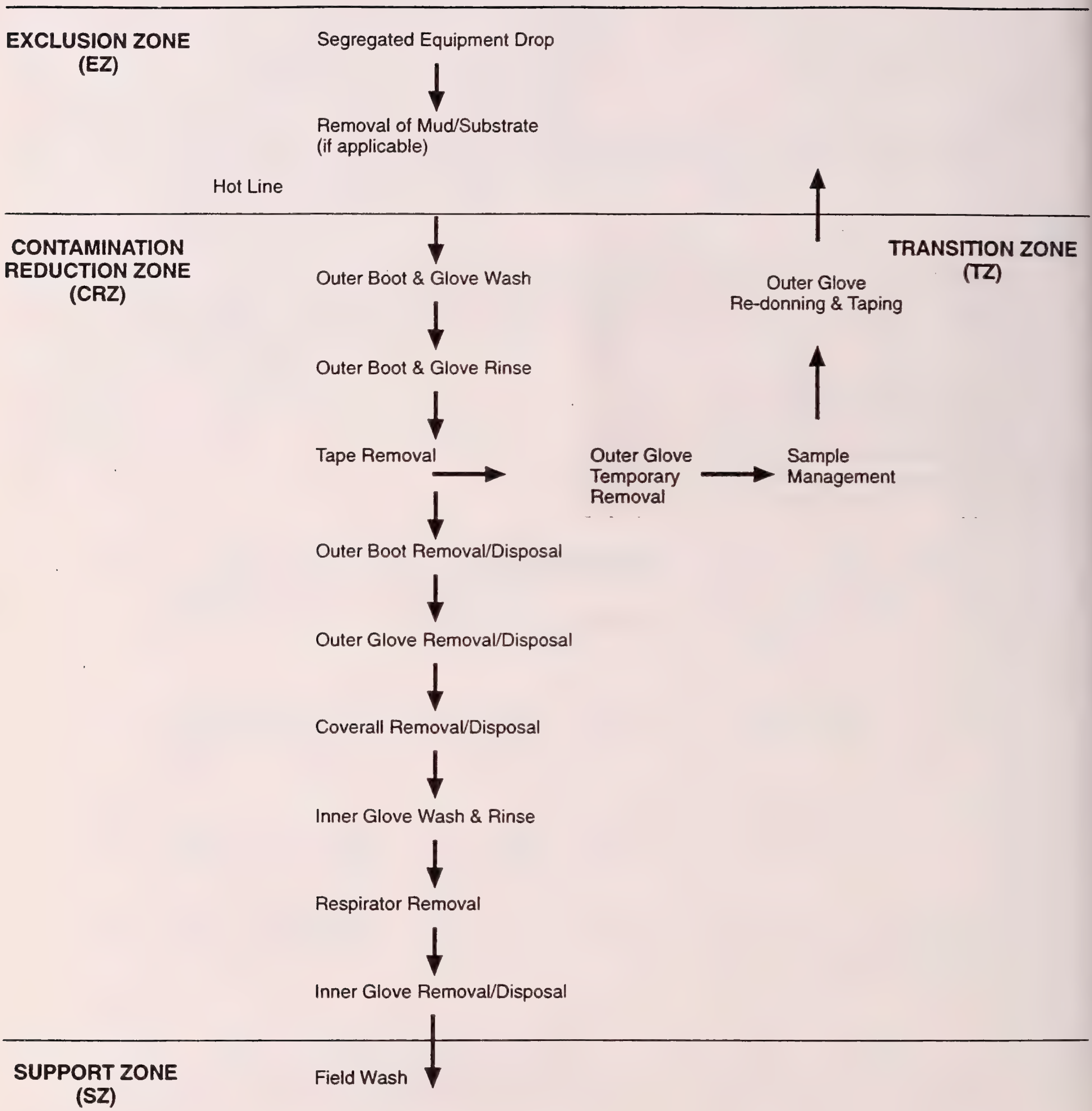
SUGGESTED DECONTAMINATION SOLUTIONS

SUGGESTED DECONTAMINATION SOLUTIONS

	Decon Solution	Mixing	Uses/Remarks
A.	An aqueous solution containing a low-sudsing detergent. Ex: Alconox, Penetone 155, Liquinox, Simple Green.	Follow the mixing instructions written on the particular product label.	Generally has the widest range of use. Best choice on sites where contaminants exist.
B.	An aqueous solution containing 5% sodium carbonate (Na_2CO_3) washing soda.	To ten gallons of water, add four pounds of sodium carbonate.	Decon solution of choice for base labile compounds such as the organophosphate pesticides. Effective in neutralizing inorganic acids. Since sodium carbonate is a water softening agent, this characteristic is an aid in physical removal of contaminants.
C.	An aqueous solution containing 5% sodium bicarbonate ($NaHCO_3$) baking soda.	To ten gallons of water, add four pounds of sodium bicarbonate.	Sodium bicarbonate can be used to neutralize either base or acid contaminants. Good decon for base labile compounds.
D.	An aqueous solution containing 2% trisodium phosphate (Na_3PO_4) TSP.	To ten gallons of water, add two pounds of trisodium phosphate.	See uses/remarks for Decon Solution B above.
E.	An aqueous solution containing 10% calcium hypochlorite ($CaCl_2O_3$).	To ten gallons of water, add eight pounds of calcium hypochlorite.	Cyanide salts.
F.	Ethylenediaminete-tetra-acetic acid (EDTA).	Commercial product, follow product label.	EDTA is a chelating agent and is the decon solution of choice for heavy metal contaminants.
G.	An aqueous solution containing 3-5% citric, tartaric, oxalic acids, or their respective sodium salts.	To ten gallons of water, add four pounds of citric, tartaric, or oxalic acid.	These compounds are chelating agents and are a decon solution of choice for heavy metal contaminants.

ATTACHMENT 3

LEVEL C DECON

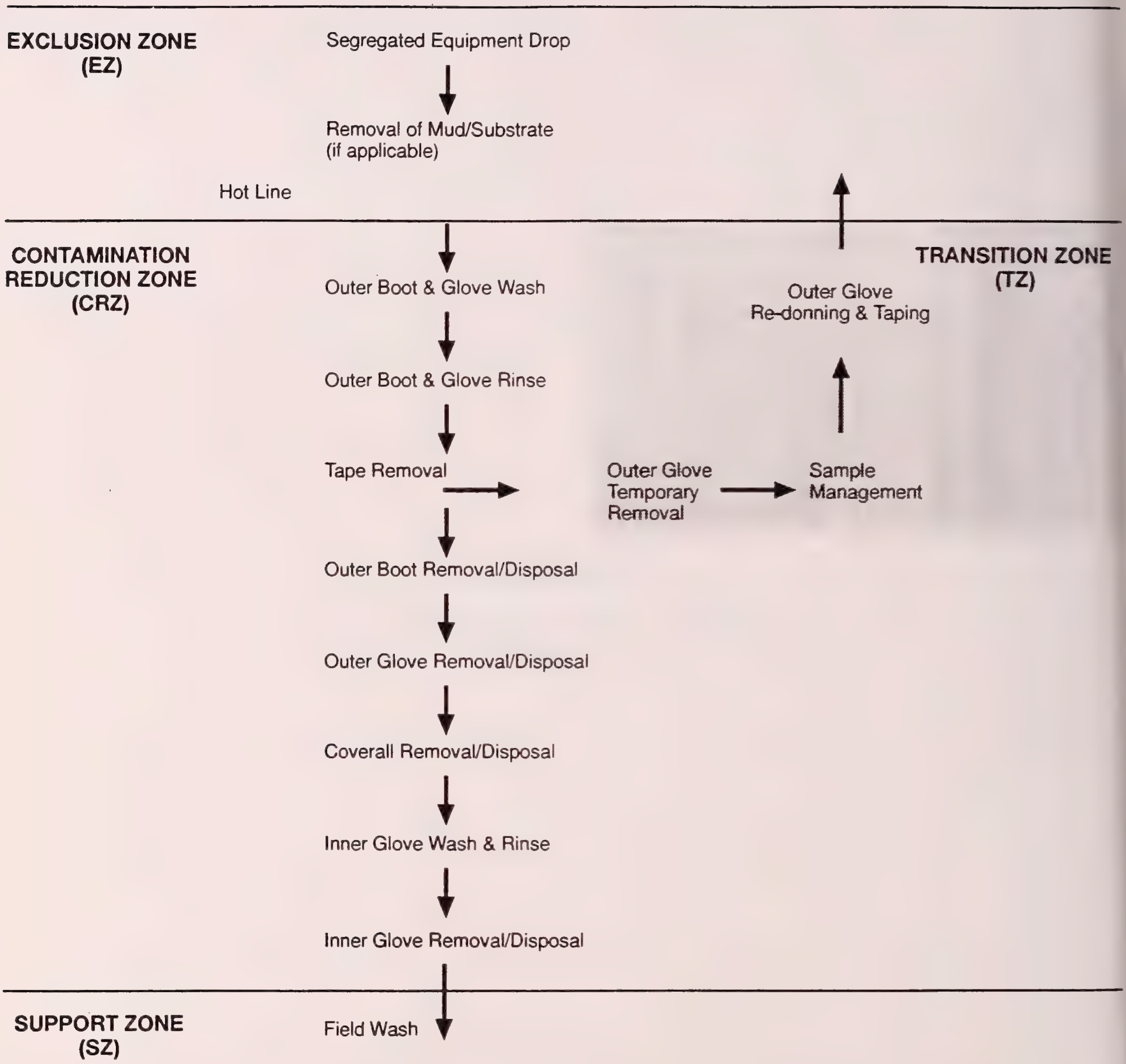


Source: NIOSH/OSHA/USCG/EPA "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities"

Level C Decon Flow Chart

ATTACHMENT 4

LEVEL MODIFIED D DECON


EXCLUSION ZONE (EZ)
Segregated Equipment Drop
Removal of Mud/Substrate (if applicable)
Hot Line
CONTAMINATION REDUCTION ZONE (CRZ)
Outer Boot & Glove Wash
Outer Boot & Glove Rinse
Tape Removal
Outer Glove Temporary Removal
Sample Management
Outer Glove Re-donning & Taping
TRANSITION ZONE (TZ)
Outer Boot Removal/Disposal
Outer Glove Removal/Disposal
Coverall Removal/Disposal
Inner Glove Wash & Rinse
Inner Glove Removal/Disposal
SUPPORT ZONE (SZ)
Field Wash

Source: NIOSH/OSHA/USCG/EPA "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities"

Level Modified D Decon Flow Chart

GDEN ENVIRONMENTAL AND ENERGY SERVICES

STANDARD OPERATING PROCEDURE

S.O.P. NO. H-7	PAGE 1 OF 2
EFFECTIVE DATE 10/1/96	REVISION NO. 2
APPROVAL Dennis L. Daggett, CIH	

TITLE **FACIAL HAIR POLICY**

1.0 PURPOSE

This policy has been developed to meet the provisions of OSHA 29 CFR, Subpart I, Section 1910.134 (e)(5)(i), *Respiratory Protection*. Through the institution of this policy, OEES strives to minimize the risk of human injury/illness resulting from respiratory exposures to hazardous materials.

2.0 SCOPE AND APPLICABILITY

This procedure applies to all OEES employees who are required to work in areas where hazardous materials and/or wastes are known or believed to exist. Specifically, it applies to those employees who are required by their supervisors, job responsibilities, or an applicable site-specific Health and Safety Plan (HSP) to wear respirators during their job assignment. In addition, it applies to those employees who may be required to don a respirator as necessitated by an emergency response or rescue. This would include, but not be limited to:

- all employees working at sites and facilities where uncontrolled hazardous conditions could be encountered, regardless of individual responsibility (e.g., support, management, and technical staff)

- employees working within labs where hazardous materials/wastes are handled and/or stored, regardless of the employee's individual responsibilities

OEES considers these employees to be a labor pool for emergency situations (fire fighting, toxic gas control, etc.) and rescue efforts, and they should therefore be able to respond at a moment's notice. For this reason, the HSCs for each OEES location maintain razors and shaving supplies.

3.0 PROCEDURE

Section 29 CFR 1910.134(e)(5)(i), *Respiratory Protection*, of the Occupational Safety and Health Administration (OSHA) Regulations reads in part: "Respirators shall not be worn when conditions prevent a good face seal. Such conditions may be a growth of beard, side-burns, a skull cap that projects under the facepiece or temple pieces on glasses." Accordingly, any applicable employee who has facial hair which intrudes into the area where the respirator seals against the face shall not be fitted with a respirator. Additionally, any applicable employee whose facial hair interferes with the respirator seal shall not be allowed to wear a respirator, even though he has previously obtained a satisfactory fit with the particular device. In those situations where employees cannot comply with the facial hair policy due to religious beliefs or medical/physical conditions (e.g., cleft palate, false teeth, or those possessing the skin condition *pseudofolliculitis barbae*), the company will make every effort to reassign the employee to a task/responsibility that does not require use of a respirator. All other employees refusing to comply with this policy may face termination after a review and investigation of the facts by the Corporate Health and Safety Director, and the supervisor.

4.0 REFERENCES

Fed-OSHA. 29 CFR 1910.134(e)(5)(i), *Respiratory Protection*.

OGDEN ENVIRONMENTAL AND ENERGY SERVICES

STANDARD OPERATING PROCEDURE

S.O.P. NO. H-8	PAGE 1 OF 12	
EFFECTIVE DATE 10/1/96	REVISION NO. 1	
APPROVAL Denise L. Daggett, CIH		

TITLE

HAZARD COMMUNICATION WRITTEN PROGRAM

1.0 PURPOSE & SCOPE

This procedure outlines the measures required under the *Hazard Communication* standard, Fed/OSHA 29 CFR 1910.1200 and Cal/OSHA Title 8, Section 5194. OEES operations in states other than California will need to compare this procedure with the individual state's health and safety regulations for consistency. The Hazard Communication Standard ensures that all potentially hazardous materials used by OEES employees are properly evaluated and handled. This procedure also describes how the hazards information is disseminated to the staff and how information regarding personal protective measures and monitoring procedures is consistent with applicable federal, state, and local regulations.

2.0 SCOPE AND APPLICABILITY

This procedure applies to all OEES employees who may be exposed, under normal working conditions or foreseeable emergencies, to any hazardous or toxic chemical which is known to be present in their workplace. It is also applicable to all chemical manufacturers and distributors with whom the company does business and who are required to provide the company with Material Safety Data Sheets (MSDSs). It does not apply to those manufacturers and distributors who may have provided the company with chemicals prior to May 25, 1986.

3.0 DEFINITIONS

Chemical - Any element, chemical compound, or mixture of elements and/or compounds.

Chemical Name - The scientific designation of a chemical in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS) rules of nomenclature, or a name which will clearly identify the chemical for the purpose of conducting a hazard evaluation.

Combustible Liquid - Any liquid which has a flashpoint at or above 100°F (37.8°C), but below 200°F (93.3°C), except any mixture having a combination of components with flashpoints of 200 °F (93.3°C) or higher, the total volume of which makes up 99 percent or more of the total volume of the mixture.

Common Name - Any designation or identification such as a code name, code number, trade name, branch name, or generic name used to identify a chemical other than by its chemical name.

Compressed Gas -

- A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70°F (21.1°C); or
- A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130°F (54.4°C) regardless of the pressure at 70°F (21.1°C); or
- A liquid having a vapor pressure exceeding 40 psi at 100°F (37.8°C) as determined by ASTM D-323-72.

Employee - A worker who may be exposed to hazardous chemicals under normal working conditions or in foreseeable emergencies.

Employer - A person engaged in a business that engages the services of others where chemicals are either used, distributed, or are produced for use or distribution, including a contractor or subcontractor.

Explosive - A chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

Exposure or Exposed - When an employee is subjected to a hazardous chemical in the course of employment through any route of entry (inhalation, ingestion, skin contact, absorption, etc.). This includes potential (i.e., accidental or possible) exposures.

Flammable - A chemical that falls into one of the following categories:

- "Aerosol, flammable" means an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening.

- "Gas, flammable" means:

  a. A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of thirteen (13) percent by volume or less; or

  b. A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than twelve (12) percent by volume, regardless of the lower limit.

- "Liquid, flammable" means any liquid having a flashpoint below 100°F (37.8°C), except any mixture having a combination of components with flashpoints of 100°F (37.8°C) or higher, the total of which makes up 99 percent or more of the total volume of the mixture.

- "Solid, flammable" means a solid, other than a blasting agent or explosive, that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and, when ignited, burns so vigorously and persistently as to create a serious hazard.

Flashpoint - The minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite.

Hazardous Chemical - Any chemical that is a physical or health hazard.

Hazard Warning - Any words, pictures, symbols, or combination thereof appearing on a label or other appropriate form of warning which conveys the hazard(s) of the chemical(s) in the container(s).

Health Hazard - A chemical for which there is statistically significant evidence, based on at least one study conducted in accordance with established scientific principles, that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes.

Label - Any written, printed, or graphic material displayed on or affixed to containers of hazardous chemicals.

Material Safety Data Sheet (MSDS) - Written or printed material concerning a hazardous chemical which is prepared in accordance with the requirements of the Hazard Communication Standard.

Mixture - Any combination of two or more chemicals if the combination is not, in whole or in part, the result of a chemical reaction.

Oxidizer - A chemical other than a blasting agent or explosive that initiates or promotes combustion in other materials, thereby catching fire itself or causing a fire through the release of oxygen or other gases.

Physical Hazard - A chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive), or water-reactive.

Trade Secret - Any confidential formula, pattern, process, device, information, or compilation of information used in an employer's business that gives the employer an opportunity to obtain an advantage over competitors who do not know or use it.

Unstable (reactive) - A chemical which, in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or become self-reactive under conditions of shocks, pressure, or temperature.

Use - To package, handle, or transfer.

Water-reactive - A chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

Work Area - A room or defined space in a workplace where hazardous chemicals are produced or used, and where employees are present.

Workplace - An establishment, job site, or project at one geographical location containing one or more work areas.

4.0 RESPONSIBILITIES

4.1 CORPORATE HEALTH AND SAFETY DIRECTOR (CHSD)

The CHSD is responsible for preparing and issuing Hazard Communication Written Program (the Program) training materials, developing and making available instruction for the Program, and periodically evaluating the effectiveness of the Program.

4.2 HEALTH AND SAFETY COORDINATOR (HSC) OR SITE HEALTH AND SAFETY COORDINATOR (SHSC)

The HSC (or SHSC) is assigned the primary responsibility for the implementation of the Program, and for assuring that the Program is in compliance with federal and state regulations. The HSC (or SHSC) is responsible for maintaining the site inventory and up-to-date files of the MSDSs. If a user reports that an MSDS is missing or was never sent, the HSC will obtain one from the supplier. The HSC maintains or shall obtain labeling materials for clearly marking containers of hazardous materials. The HSC (or SHSC) is also responsible for arranging for new hire orientation including basic hazard communication training and ongoing hazard communication training as required.

4.3 USER

The user, defined as an employee or contractor, is responsible for attending the Hazard Communication training sessions, applying the health and safety information that is derived from them, and ensuring that an MSDS is available for any chemical he/she uses or procures. If an MSDS for a chemical does not arrive with the shipment of the chemical or is not available for any other reason, the user will notify the HSC. The user shall also be responsible for ensuring that the chemicals in use in the work area are adequately labeled in accordance with this procedure. The user shall be able to utilize the hazard warning information on the label. Any condition observed by the user that could impact worker health and safety must be reported to the supervisor or HSC.

4.4 SUPERVISOR

The supervisor is responsible for ensuring that workers under his/her supervision are properly trained and provided with the necessary control measures and protective equipment to maintain a safe and healthful workplace.

5.0 CHEMICAL INVENTORY

Any hazardous material in any quantity on OEES property or sites will be inventoried by the HSC (for office locations), SHSC (for sites), supervisor (for work areas), or designee. The inventory information includes the substance name (as referenced on the MSDS), storage location, and quantity. The inventory may be compiled for the workplace as a whole or for individual work areas.

The inventory will be updated quarterly, or more frequently, as necessary. An example of an appropriate Chemical Inventory Form is provided as Attachment 1.

6.0 HAZARD DETERMINATION

6.1 POLICIES: SUPPLIED COMMERCIAL CHEMICALS

A hazard determination will be performed on all chemicals prior to their introduction into the workplace by the HSC, SHSC, supervisor, or designee. For most raw materials and consumable products, OEES will rely on the supplier's hazard determination information, which will usually be in the form of a MSDS. MSDSs received by the HSC, SHSC, supervisor, or designee will be reviewed to ensure that they are complete and that the information is accurate. The hazard determination will be conveyed to the ultimate user by labels, MSDSs, and training. The HSC, SHSC, supervisor, or designee will work with users to ensure that they have been informed of the necessary handling procedures, issued applicable personal protective equipment (PPE), and provided with any other information before the handling of a new hazardous material is permitted.

6.2 REFERENCE RESOURCES

As a reference, OEES uses the following sources of information for comparison in determining if a substance is hazardous:

A. 29 CFR 1910, Subpart Z (Tables Z-1 to Z-3), Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA).

B. "Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment," American Conference of Governmental Industrial Hygienists (ACGIH), latest edition.

Sources of information for the determination of a substance as carcinogenic or potentially carcinogenic include:

A. National Toxicology Program (NTP), Annual Report on Carcinogens, latest edition.

B. International Agency for Research on Cancer (IARC) "Monographs," latest edition.

C. 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances, OSHA.

The HSC, SHSC, supervisor, or designee can contact the CHSD for copies of the above reference materials.

7.0 MATERIAL SAFETY DATA SHEETS (MSDSs)

Any hazardous substance received by the company shall be accompanied by a MSDS representing that substance. Each MSDS shall be printed in English and contain the following information:

- Identity of the substance as depicted on the label (chemical or common name(s) and ingredients)

- Physical and chemical characteristics of the hazardous substance (e.g., vapor pressure, flashpoint, etc.)

- Physical hazards of the substance, including the potential for fire, explosion, corrosivity, and reactivity

- Health hazards of the substance, including signs and symptoms of exposure, and any medical conditions which are generally recognized as being aggravated by exposure to the chemical

- Primary routes of entry

- OSHA permissible exposure limit (PEL) or ACGIH threshold limit value (TLV)

- Substance's carcinogenicity

- Safe handling procedures

- Applicable control measures

- Emergency first aid procedures

- Date of preparation or last update of the MSDS

- Name, address, and telephone number of the chemical manufacturer or party responsible for the preparation of the MSDS

MSDSs that lack any of the above information will be investigated by the HSC, SHSC, supervisor, or designee so that a complete MSDS can be obtained.

7.1 LOCATION

The MSDSs are in a binder and must be immediately and freely available in the employee's work area(s) on a 24-hour basis.

7.2 PROCEDURES

All personnel are informed that, if they receive any MSDSs from outside suppliers, the original or a copy must be forwarded to their supervisor or the HSC. The supervisor must forward all MSDSs to the HSC. Any MSDS revisions received that alert the company to an increased risk associated with a hazardous material will be provided to employees and involved contractors within 30 days of receipt.

7.3 TRAINING

Hazard Communication training is provided to all employees and contractors involved in the handling of hazardous materials. A majority of the training is devoted to familiarizing the attendees with the structure of and information supplied on MSDSs. When practical, training will be done by reviewing the MSDSs for each individual chemical. When a location or site has a large number of chemicals, or when the chemicals change frequently, training will be based on hazard categories (such as flammable liquids, corrosive materials, carcinogens). Example MSDSs will be used to illustrate use and applicability of the health and safety information provided. A description of the Hazard Communication training is presented in Section 9.

8.0 LABELING AND PRODUCT IDENTIFICATION OF CONTAINERS

8.1 POLICIES: SUPPLIED COMMERCIAL MATERIALS

All employees and contractors will be informed that they should check all incoming hazardous material container labels for the following information:

- Identity of product
- Appropriate hazard warning
- Name and address of chemical manufacturer, importer, or other responsible party

Labels must be legible and prominently displayed. No existing label will be removed or defaced on containers of hazardous materials. An example of an acceptable label is provided as Attachment 2.

Manufacturers or vendors responsible for the shipment of improperly labeled materials shall be notified upon receipt of such materials. Recurring shipments of mislabeled or unlabeled chemicals from a manufacturer or vendor shall be cause for terminating business with the supplier.

8.2 REPACKAGING

Any material that is repackaged from the original label-bearing container to another container must be relabeled with a suitable substitute label containing at a minimum the identify of the product and the appropriate hazard warning. All portable containers into which hazardous materials are transferred must be labeled (i.e., lab squeeze bottles and field spray bottles), unless the hazardous substance is for immediate use by the employee who performed the transfer. Labels are available from the HSC, SHSC, supervisor, or designee.

8.3 TRAINING

Employees receive training in how to read and interpret the information contained on the label of a hazardous material. Where applicable, employees must also be provided with information regarding the hazards associated with chemicals contained in unlabeled pipes in the work area.

9.0 HAZARD COMMUNICATION TRAINING

9.1 BASIC COURSE CONTENT

As part of the New Hire Orientation training, all employees receive basic Hazard Communication training from the HSC and their supervisor. Information provided may be in the form of a booklet or handout. Instruction will cover the following:

- The scope and extent of the regulation
- How to read a MSDS
- The method of labeling containers used in the work area (to include immediate use, tanks, and waste containers), and how to read a label
- Physical and health hazards associated with hazardous materials

- Methods to detect hazardous chemicals in the workplace
- Measures to protect oneself from exposure, including, if necessary, the use of PPE and emergency procedures

Employees who attend the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) training receive more extensive Hazard Communication training. Training outlines are provided in the Training Program, Volume IV of the Corporate Health and Safety Manual.

9.2 PERIODIC TRAINING

As necessary, periodic training of the above described subjects should be conducted by the HSC, SHSC, supervisor, or designee, as applicable. This training may take the form of MSDS reviews for the hazardous materials used in the work area. Hazard Communication training shall be conducted anytime a chemical hazard changes in the workplace. Training shall be conducted within 30 days of receiving the information.

Before a new hazardous material is introduced into the workplace, all involved users must receive training on the specific hazards of that chemical. This may be accomplished by a review of the MSDS by the HSC, SHSC, supervisor, or designee with the affected staff.

10.0 CONTRACTORS AND SUBCONTRACTORS

10.1 POLICIES

Concerning work where contractors and subcontractors may have potential exposure to hazardous materials, the HSC, SHSC, supervisor, or designee will provide the contractor or subcontractor with the MSDSs. The HSC, SHSC, supervisor, or designee will also be responsible for providing the identity and location of hazardous materials to the contractor representative. The SHSC or HSC shall explain to the contractor or subcontractor the safe work practices and labeling system used in the workplace specific to the chemical(s) being used onsite. This information will be provided by a written site-specific Health and Safety Plan or by direct instruction by the HSC or supervisor.

In instances where the contractor may bring hazardous materials onto the OEES site or project location, the HSC, SHSC, supervisor, or designee will obtain the identities of, and the MSDSs for, these materials from the contractor. The contractor will also explain to the HSC, SHSC, supervisor, or designee the safe work practices and labeling system specific to the chemicals being used onsite.

11.0 REFERENCES

Fed-OSHA. 1995. 29 CFR 1910.1200, *Hazard Communication.*

Cal-OSHA. 1995. Title 8, Section 5194, *Hazard Communication.*

12.0 ATTACHMENTS

1. Chemical Inventory Form
2. Example of an Acceptable Label

ATTACHMENT 1

CHEMICAL INVENTORY FORM

OGDEN

Completed by: ____________

Date: ____________

HAZARD COMMUNICATION CHEMICAL INVENTORY FORM

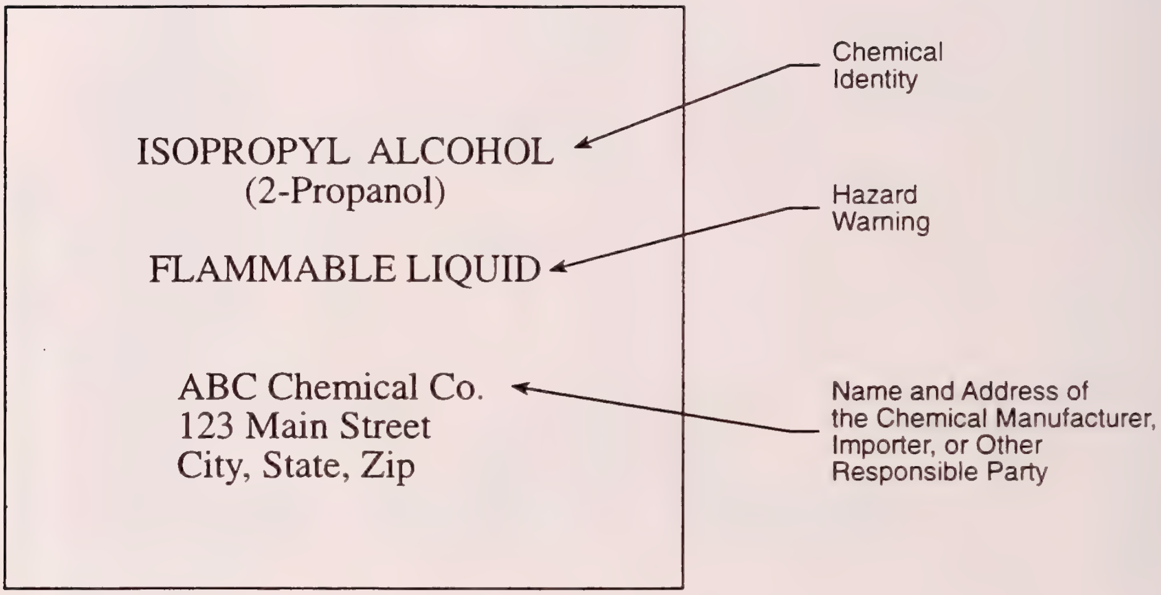
Project: ____________ Location: ____________

Chemical Name	Quantity	Is it labeled?	Do you have the MSDS?

ATTACHMENT 2

EXAMPLE OF AN ACCEPTABLE LABEL

Example of an Acceptable Label



ISOPROPYL ALCOHOL
(2-Propanol)

FLAMMABLE LIQUID

ABC Chemical Co.
123 Main Street
City, State, Zip

Chemical Identity
Hazard Warning
Name and Address of the Chemical Manufacturer, Importer, or Other Responsible Party

GDEN ENVIRONMENTAL AND ENERGY SERVICES

STANDARD OPERATING PROCEDURE

S.O.P. NO. H-9 | PAGE 1 OF 20

EFFECTIVE DATE 10/1/96 | REVISION NO. 1

APPROVAL Denise L. Waggett, CIH

LE

HEAT STRESS CONTROL

1.0 PURPOSE

The purpose of this procedure is to provide information on the causes, detection, prevention, and treatment of heat stress.

2.0 SCOPE

This procedure should be utilized by all OEES onsite personnel and subcontractors working on OEES field projects.

3.0 RESPONSIBILITIES

3.1 SITE HEALTH AND SAFETY COORDINATOR/PROJECT MANAGER

The Site Health and Safety Coordinator (SHSC) and Project Manager (PM) are responsible for implementing these procedures. Specific duties/responsibilities include:

- having knowledge about the signs and symptoms of heat stress
- assuring appropriate time is allowed for acclimatization
- ensuring that employees practice appropriate heat stress prevention techniques
- completion of Heat Stress Monitoring form (Attachment 1) when conditions necessitate its use

3.2 HEALTH AND SAFETY MANAGER

The Health and Safety Manager (HSM) is responsible for auditing or evaluating onsite activities to ensure that these procedures are implemented.

4.0 PROCEDURES

4.1 INTRODUCTION

Heat is a physical stress on the human body. Exposure to excessive heat can develop into a serious health condition known as heat stress. If the proper measures are not taken to prevent or treat heat stress, the condition can become debilitating and perhaps fatal.

The two most likely sources of heat stress that could be encountered by OEES field personnel are external heat produced by: (1) high air temperatures and humidity, and (2) heat generated from the human body which cannot dissipate. Protective garments can greatly hinder the body's mechanism of evaporative cooling, causing the body temperature to rise.

4.2 HOW THE BODY HANDLES HEAT

Under moderate conditions of work and environmental heat, the brain regulates the body's temperature by monitoring the temperature of the blood. When the blood temperature rises above 98.6°F, the body initiates heat control mechanisms. The two major mechanisms of thermoregulation are increased blood flow and sweating.

4.2.1 Increased Blood Flow

As the heart begins to pump more blood towards the skin, excess body heat is lost to the air through convection, radiation, evaporation, and conduction depending on air temperature, humidity, and air movement.

Convection

Convection is the transfer of heat by movement of the thin layer of insulating air next to the skin. Air movement causes a cooling action. In the absence of wind, the more intense the heat effect will be.

Radiation

Radiation is the transfer of heat to cooler objects in the surrounding environment. The heat is transferred through space between objects that are not in direct contact with each other.

For example, the heat from a broiler will warm objects in its surrounding area. In the same way, the body's heat will transfer to a cooler environment or will warm in the presence of a hotter environment.

Evaporation

Evaporation is the absorption of moisture into the air. Evaporation of moisture from the skin cools the body. The rate of this evaporative cooling is significantly increased by convection or air movement across wet skin and/or wet clothing. The amount of evaporation is also increased by low humidity. When humidity is high, the heat hazard increases.

Conduction

Conduction is the transfer of heat between objects that are in contact with each other. For example, touching a piece of metal that is hotter than skin temperature will conduct heat toward the body.

4.2.2 Sweating

When heat loss by increased blood flow is not enough to keep the body core temperature normal, the brain signals the sweat glands in the skin to begin producing sweat (mixture of water and salts). The sweat evaporates on the skin and cools the skin surface. Sweating does nothing to cool the body unless the sweat can evaporate from the skin. When humidity is high, evaporation of perspiration slows down or stops. As the heart labors to pump more and more blood to the surface and the sweat glands continue to pour liquids onto the skin surface, the production of internal body heat continues. If this condition is not dealt with at this stage, heat stress disorders can arise rapidly.

As more blood flows to the skin, less blood remains to supply the active muscles. Strength declines and fatigue may come sooner than it would otherwise. Behavioral changes can arise in the forms of reduced accuracy, comprehension, and retention. In addition to these physiological changes, certain safety problems commonly arise in hot environments:

- sweaty palms resulting in impaired functional ability
- dizziness
- fogging of safety eyewear
- possible burns from accidental contact with hot surfaces

4.3 MONITORING THE HOT WORK ENVIRONMENT

There are two commonly recognized methods to measure the working conditions for heat hazard. One method employs measuring the actual environment for important physical parameters. The other monitoring technique, often used in tandem with environmental monitoring, is personal monitoring.

4.3.1 Environmental Monitoring

Evaluating the work environment to determine the degree of heat stress involves measuring and recording four different physical factors:

- air temperature
- humidity
- radiant temperature
- air speed

Many different ways have been devised to evaluate the above mentioned parameters. The method recognized by the American Conference of Governmental Industrial Hygienists (ACGIH) is commonly known as Wet Bulb Globe Temperature (WBGT). WBGT values are calculated based on the following equations:

(1) Outdoor with solar load
$$WBGT = 0.7\,(WB) + 0.2\,(GT) + 0.1\,(DB)$$

(2) Indoors or Outdoors with no solar load
$$WBGT = 0.7\,(WB) + 0.3\,(GT)$$

WBGT = Wet Bulb Globe Temperature Index
WB = Natural Wet-Bulb Temperature

DB = Dry-Bulb Temperature
GT = Globe Temperature

NOTE: Temperatures can be recorded in either °F or °C, but must be used consistently throughout the equation.

These measurements are made using specialized heat stress measuring equipment that measure each of the temperature parameters of the equation above. Instruments that measure the various temperature parameters, as well as calculate the WBGT for the user, are also available. To obtain the equipment, contact a manufacturer (i.e., Metrosonics, Inc.) or a local instrument rental company. The monitoring should be made by an industrial hygienist or an appropriately trained SHSC who is familiar with the instruments and work being performed. Measurements are recorded on the Heat Stress Monitoring Form (Attachment 1).

The recommended ACGIH Threshold Limit Values (TLVs) are presented in Attachment 2.

4.3.2 Personal Monitoring

Individuals vary in their susceptibility to heat stress. Factors that may predispose an individual to heat stress include:

- Lack of physical fitness
- Lack of acclimatization
- Age
- Dehydration
- Obesity
- Alcohol and drug use
- Infection
- Sunburn
- Diarrhea
- Chronic disease

When workers must wear semipermeable or impermeable encapsulating personal protective garments the ACGIH recommended TLV's cannot be used. For these situations, employees should be monitored when the temperature in the work area is above 70°F (21°C). When impermeable clothing will be worn, exposure limits will be established by applying adjustment factors to the values in Attachment 2. Adjustment factors are as follows:

WBGT Correction Factor* (˚C)

Coveralls	2
Kleenguard Coveralls	4
Standard Tyvek	6
Tyvek, PE	7
Encapsulating Suit	11

*Subtract correction factor (˚C) from the WBGT in Attachment 2.

To monitor an employee for heat stress, one can measure any of the following parameters:

- Heart rate. Count the radial pulse during a 30-second period as early as possible in the rest period.

  If the heart rate exceeds 110 beats per minute (bpm) at one minute into the rest period, shorten the next work cycle by one-third and keep the rest period the same duration.

  If the heart rate still exceeds 110 bpm at one minute into the next rest period, shorten the following work cycle by one-third.

  If the heart rate exceeds 120 bpm at one minute into the rest period, the worker is under a significant strain and risk and the worker should be removed from the shift until his/her heart rate returns to normal.

- Oral temperature. Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the start and end of the work period. In order to obtain accurate results, workers shall not eat or drink for 15 minutes prior to oral temperature monitoring. There shall be no talking or mouth breathing when the thermometer is measuring the temperature.

  If oral temperature exceeds 99.6˚F (37.6˚C), shorten the next work cycle by one-third without changing the rest period duration.

  If oral temperature still exceeds 99.6˚F (37.6˚C) at the beginning of the next rest period, shorten the following work cycle by one-third.

Do *not* permit a worker to wear a semipermeable or impermeable garment when his/her oral temperature exceeds 100.6°F (38.1°C).

- Body water loss, if possible. Measure weight on a scale accurate to ± 0.25 pound (lb) at the beginning and end of each workday to see if enough fluids are being taken to prevent dehydration. Weights should be taken while the employee wears similar work clothing. If the change in body weight divided by the body weight, when multiplied by 100, exceeds 1.5 then there is likely dehydration. *The body water loss should not exceed 1.5 percent total body weight in a work day.*

- Behavioral. Other indications of heat stress may be recognized from worker behaviors that include:

  - adjusting clothing
  - slowing down
  - increased number of mini-breaks
  - irritability
  - low morale
  - absenteeism
  - increased number of errors
  - shortcuts in maintenance

  The SHSC should monitor personnel for these changes in worker behavior.

4.4 HEAT ILLNESSES

4.4.1 Heat Cramps

Description:

- Spasms in voluntary muscles due to reduction in the concentration of sodium chloride with continued loss of salt in sweat and copious intake of water without appropriate salt replacement. Other electrolytes, such as magnesium, calcium, and potassium may also be involved.

Symptoms:

- Painful spasms of muscles used during work. May occur during or after work hours.

Possible Underlying Causes:

- Drinking large quantities of water without replacing salt loss
- Excessive perspiration during hot work

Treatment:

- Administer lightly salted water by mouth unless on medical restriction. Consult physician.
- Adequate salt intake with meals. Those on salt-restricted diets should consult their physician for guidance.
- Do not follow fad or restrictive diets while working in heat conditions except under physician's advice.

4.4.2 Heat Syncope

Description:

- Pooling of blood in dilated vessels of skin and lower parts of body.

Symptoms:

- Fainting while standing erect and immobile in the heat

Possible Underlying Causes:

- Lack of acclimatization

Treatment:

- Remove to cooler area
- Recovery should be prompt and complete
- Consult physician

4.4.3 Dehydration

Description:

- Excessive loss of body water

Symptoms:

- No early symptoms
- Fatigue/weakness
- Dry mouth
- Loss of work capacity
- Increased response time

Possible underlying causes:

- Excessive fluid loss due to sweating
- Excessive fluid loss due to illness (such as vomiting or diarrhea)
- Excessive fluid loss due to alcohol consumption

Treatment:

- Remove to cool area
- Fluid replacement

4.4.4 Heat Rash ("Prickly Heat")

Description:

- Keratinous layers of skin absorb water, swell, and mechanically obstruct the sweat ducts.

Symptoms:

- Profuse, tiny, raised, red vesicles (blister-like), usually in areas where clothing is restrictive
- Prickling sensation during heat exposure, particularly as sweating increases

Possible underlying causes:

- Occurs on skin that is persistently wetted by unevaporated sweat
- Plugging of sweat gland ducts with retention of sweat and inflammatory reaction

Treatment:

- Clean, cotton garments against the skin
- Mild drying lotions
- Skin cleanliness to prevent infection

4.4.5 Heat Exhaustion

Description:

- Low arterial blood pressure caused partly from inadequate cardiac output and partly from widespread vasodilation.

Symptoms:

- Skin clammy and moist, profuse sweating, coloring pale or muddy
- Extreme fatigue, weakness, blurred vision, dizziness, nausea, headache or light-headedness
- Insecure gait, may faint while standing
- Exhibits rapid pulse and low blood pressure
- Oral temperature normal or low, rectal temperature may be elevated to 99°F to 101°F

Possible Underlying Causes:

- Lack of acclimatization/fitness
- Continuous exertion in heat
- Failure to replace water/salt lost in sweat, or from gastrointestinal maladies (dehydration)
- Distribution of blood to the periphery

Treatment:

- Remove to cooler area
- Administer fluids by mouth (if victim is conscious) or give intravenous infusions of normal saline. This should be done under care of a physician, especially for those on medically restricted diets.

4.4.6 Heatstroke

Description:

- Failure of the thermoregulating system.

Symptoms:

- Chills; hot, dry skin; red, mottled or bluish
- High, rising deep body (core) temperature: 104°F and over
- Mental confusion, restlessness, irritability, belligerence, loss of consciousness, convulsions or coma as temperature rises

Possible Underlying Causes:

- Continuous exertion in heat by unacclimatized employees
- Lack of acclimatization
- Obesity
- Recent alcohol consumption
- Dehydration
- Individual workers' susceptibility
- Chronic cardiovascular disease

Treatment:

- Call emergency medical services for assistance. Inform ambulance on telephone that heat illness emergency exists.
- Danger - Fatal if treatment is delayed. Cool body while awaiting ambulance
- Immediate cooling of victim by immersion in chilled water
- Wrapping victim in wet sheet while fanning with cool, dry air
- Sponging with cool liquid and fanning
- Treat shock, if necessary

4.5 PREVENTING HEAT STRESS

Heat stress can be prevented by taking personal protective measures, such as allowing for acclimatization, ensuring fluid replacement, satisfying the body's salt requirements, modifying work practices, and other control measures.

4.5.1 Acclimatization

The human body has a dramatic adaptation mechanism for working in the heat called acclimatization. Any unprepared employee when exposed for the first time to a hot work environment will develop signs of significant strain such as elevated body temperature, pounding heart, high pulse rate, and sweating. But the body will, over a series of days spent working in the heat, make a series of adjustments. These adjustments, which include the decreasing of body temperature and pulse rate, will occur after the individual has worked in the heat for a week for at least two hours per day.

After acclimatization has taken place, work in the heat can be performed with a major reduction in strain. This allows the employee to work more effectively under conditions that may have been intolerable before acclimatization.

An important point to emphasize – acclimatization will not take place if workers do not drink enough water to replace body fluids lost to sweating. Also, acclimatization is gradually lost if work in heat stops. Some degree of acclimatization is lost over a weekend and a large degree would be lost over a full week. It is significant to remember that when employees are first exposed to the heat, or when they are returning from time off such as vacation, the workload should be reduced until acclimatization can occur.

4.5.2 Fluid Replacement

Employees must be encouraged to drink enough fluid to replace the fluid that is lost through sweating. Employees should be told to drink often throughout the day. Fluid replacement should occur at 20-minute intervals and coincide with cool-down breaks. Workers should begin the day with 16 oz. (2 cups) of water and then about 8 oz. (1 cup) every break. Cool water (about 10-15° C) is the ideal replacement fluid. Employees who are sweating heavily must be encouraged to drink large amounts of water every 20-30 minutes whether they are thirsty or not. Thirst is a poor indicator under these conditions because by the time thirst is felt, heat stress already exists. Intermediate decon (as defined in the Decontamination Procedures section of the hazardous waste site-specific Health and Safety Plan [HSP]) may be performed for short heat stress mitigation breaks on hazardous waste sites.

4.5.3 Salt Requirements

Sweat contains water, salt and other electrolytes. The body needs a certain amount of salt to function properly, but using salt tablets is not recommended. Salt tablets cause stomach irritation which may result in nausea and vomiting.

Presently, it is recommended that drinking water for employees not be salted, because the normal diet should provide adequate salt intake. However, if heat cramps are observed, slightly salted water (0.1% or 1 teaspoon of salt/15 quarts water) or an electrolyte replacement fluid (ex: Gatorade^{TM}) should be provided. Caution should be taken by individuals with high blood pressure or on a sodium-restricted diet.

4.5.4 Work Practices

Preventive work practices can be used as either an alternative or complementary approach to engineering controls for preventing heat stress. Preventive practices may include:

- limiting or modifying the duration of exposure time
- building the heat tolerance of the worker by heat acclimatization and physical conditioning

- establishing a work-rest regimen that provides adequate rest periods for cool down

- training workers in safety and health procedures for work in hot environments

The following are ways to control the daily length of time and temperature to which a worker is exposed in heat stress conditions:

- schedule hot jobs for cooler parts of the day

- schedule routine maintenance, repair work, and field projects in hot areas for the cooler seasons of the year

- alter the work-rest regimen to permit more rest time (the initial work period for an acclimatized worker should not exceed 1 - 1.5 hours, followed by a cool down of at least 15 minutes)

- provide cool, shaded areas for rest and recovery during the work shift

- add extra personnel to reduce exposure time for each member of the work crew

- permit freedom to interrupt work when a worker feels extreme heat discomfort

The heat tolerance of workers can be enhanced in the following ways:

- establish an appropriate heat-acclimatization program

- gradually increase the thermostat in sleeping quarters for off-duty hours so that daily adjustment to the temperature at the project site is made easier

- encourage workers to achieve and maintain physical fitness

- ensure that an adequate supply of water is taken (roughly 8 ounces every 20 minutes)

- maintain the electrolyte balance in the body fluids

A work-rest regimen that provides adequate periods for cool down should be established. Work-rest periods will be adjusted based on the condition of the heat-exposed worker. When impermeable protective garments are worn, they will be removed during the cool-down period to allow for adequate recovery. Breaks shall be taken in a shaded, cool rest area (77°F or lower is best).

4.5.5 Training

Workers will be trained in accordance with Volume IV, Training Program, of this manual in health and safety procedures for work in hot environments. Such workers will be familiar with the preventive measures outlined in Volume II, Comprehensive Field Project Health and Safety Program, of this manual and in the site-specific HSP (when applicable), as well as early recognition of the signs and symptoms of heat illnesses and initiation of first aid and corrective procedures. Training topics will include:

- signs and symptoms of heat-induced illnesses
- causes and recognition of heat illnesses
- work practices to minimize heat illnesses
- proper care and use of heat protective clothing and equipment
- effects of nonoccupational factors (such as drugs, alcohol, and obesity) on tolerance to occupational heat stress
- buddy system designed to recognize the early signs and symptoms of heat illnesses

4.5.6 Additional Control Measures

Engineering Controls

Engineering controls are measures which may be used to reduce the stress of a hot environment. They include, but are not limited to:

- use of increased general ventilation or spot cooling to reduce temperatures in the work location

- use of local exhaust ventilation at points of high heat production to remove large quantities of sensible and/or latent heat from the work area

- use of large fans to increase the air velocity over the workers and thereby increase the evaporative heat loss (Caution: if air temperature is greater than 95°F, the use of fans will increase the heat stress. Cool the air instead being careful to avoid causing drafts that will disturb any existing exhaust ventilation controls)

- Application of radiant heat shielding may be helpful by such methods as:

    - insulating heat-producing equipment

    - covering exposed body parts with clothing

    - using reflective screens (made up of material such as polished aluminum, tin, or zinc) placed between the worker and the radiant heat source to reflect the heat back to the source

    - wearing reflective aprons or reflective clothing (especially useful when the workers face the heat source)

- Elimination of steam leaks, by hooding or covering of steaming tanks, hot water drains, etc., to reduce the water vapor pressure at the work site

- Isolation, relocation, redesign, or substitution of equipment and/or processes to reduce the thermal stress at the work site

- A wider use of work-saving devices (such as power tools, hoists, cranes or other lifting aids) to reduce the metabolic workload

- As feasible, provisions for field "showers" or hose-down areas to cool the body down

Administrative Controls

Administrative work practice controls are most easily implemented and include any and all work practices or rules that may reduce the total heat stress burden. Included are:

- Acclimatization to the heat
- A work-rest schedule designed to reduce peaks of heat stress
- Enforcing scheduled rest breaks
- If possible, providing air-conditioned rest areas to give rapid recovery (this practice decreases the cumulative effects of heat exposure)
- Enforcing a schedule of frequent water ingestion breaks and provision of abundant, cool drinking water
- Scheduling the hottest work for the coolest parts of the day
- Where possible, moving work indoors or to air-conditioned or cooler areas
- Assigning extra workers to highly demanding tasks to reduce the individuals' metabolic loads
- Allowing employees to pace themselves and take frequent rest breaks
- Rotating duties for hot jobs
- Enforcing the buddy system
- Educating workers on the basic principles of preventing heat stress illnesses and on emergency response to heat illness
- Cooling sleeping quarters to allow skin to dry between heat exposures

Personal Protective Equipment

Personal protective equipment (PPE) includes a wide range of items such as ordinary work clothing, liquid cooling systems, ice-cooled body suits, and reflective clothing for radiant heat. The correct clothing depends upon the specific heat stress situation. The HSP will identify appropriate garments for heat stress management.

Where air temperature is higher than the skin temperature or there is radiant heat (i.e., from a furnace or the sun), then clothing will protect the body. The advantage of wearing clothing, however, is negated if the clothes interfere too much with the evaporation of sweat, which is a vital cooling function.

Clothes made of thin cotton fabric help evaporate sweat by picking it up and bringing it to the surface. Nonbinding clothes are also good for sweat evaporation. In contrast, tightly-fitting clothes made of synthetic fabrics interfere with evaporation.

4.6 CONTROL PROGRAM FOR HEAT STRESS

The OEES heat stress control program includes the following elements:

- Medical supervision of workers including preplacement physicals that evaluate fitness, weight, cardiovascular system and other conditions that may make an individual susceptible to heat illnesses. Medical evaluation during and after heat illnesses and medical release for returning to work should also be included.

- Employee training and education on heat stress, heat-induced illnesses and their symptoms, water and salt replacement, clothing, work practices, and emergency first aid procedures.

- Acclimatization of employees for work in the heat.

- Work-rest regimens with air-conditioned rest areas and enforced rest breaks.

- Water provisions of cool, plentiful water supplies and scheduled water breaks. Employees should be encouraged to weigh themselves daily to avoid dehydration.

- Environmental monitoring using one of the heat stress indices to determine the heat load and adjust work-rest regiments accordingly.

- Forecast of episodes of extreme heat or heat spells whereupon a number of preventive practices would be initiated.

- Reduction of heat stress by the proper use of engineering controls, administrative controls, or personal protective equipment.

5.0 RECORDS

Ambient temperature records and heat stress mitigation methods shall be recorded on the Heat Stress Monitoring Form, Attachment 1, by the SHSC or designee.

6.0 REFERENCES

National Safety Council. 1985. *Pocket Guide to Heat Stress.*

American Conference of Governmental Industrial Hygienists. *Threshold Limit Values and Biological Exposure Indices for 1995-1996.*

National Safety Council. 1988. *Fundamentals of Industrial Hygiene*. 3rd Edition.

Patty, F.A. 1991. *Patty's Industrial Hygiene and Toxicology, General Principles*. Edited by George D. Clayton and Florence E. Clayton. Vol. I, Part A. 4th Edition. New York: Wiley and Sons, Inc.

7.0 ATTACHMENTS

1. Heat Stress Monitoring Form
2. Permissible Heat Exposure Threshold Limit Values

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ATTACHMENT 1

HEAT STRESS MONITORING FORM

OGDEN

Heat Stress Monitoring Form

Site Information

Page _____ of _____

Project ______________________ Field Manager ______________________

Date ______________________ Site Health and Safety Coordinator ______________________

Site Location ______________________

Site Personnel ______________________

Reading No.	Time	Reading Description	Location or Job Task	Instrument Type	Reading	Comments

ATTACHMENT 2

PERMISSIBLE HEAT EXPOSURE THRESHOLD LIMIT VALUES

PERMISSIBLE HEAT EXPOSURE THRESHOLD LIMIT VALUES
(Values are given in °C and °F WBGT)

Work-Rest Regimen	Work Load		
	Light	Moderate	Heavy
Continuous Work	30.0°C 86°F	26.7°C 80°F	25.0°C 77°F
75% Work - 25% Rest, each hour	30.6°C 87°F	28.0°C 82°F	25.9°C 78°F
50% Work - 50% Rest, each hour	31.4°C 89°F	29.4°C 85°F	27.9°C 82°F
25% Work - 75% Rest, each hour	32.2°C 90°F	31.1°C 88°F	30.0°C 86°F

NOTE: For unacclimatized workers performing a moderate level of work, the permissible heat exposure TLV should be reduced by approximately 2.5°C.

Source: American Conference of Governmental Industrial Hygienists. *Threshold Limit Values and Biological Exposure Indices for 1995-1996.*

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EFFECTIVE DATE 10/1/96	REVISION NO. 1
APPROVAL Denise L. Daggett, CIH	

TITLE **HEARING CONSERVATION PROGRAM**

1.0 PURPOSE

Hearing is one of the human senses that is indispensable in the workplace for communication and safety reasons. However, it is the one sense that is easily damaged to the point of irreversibility by overexposure to occupational noise. Twenty to 30 percent of the ear's hair cells must be destroyed before noise-induced hearing loss (NIHL) can even be detected in an audiometric exam. Once serious permanent damage has taken place, there is essentially no means to restore hearing apart from hearing aid devices. Of the population that has experienced permanent hearing loss, the majority have lost their hearing from long-term exposure to "lower" levels of noise (70-90 decibels). Pain is not evident until noise levels reach roughly 130 decibels (dB), so the worker typically does not even realize they have been overexposed.

OEES is committed to providing a safe and healthful work environment, and therefore makes every effort to engineer control measures into equipment and facilities to eliminate noise problems. When control measures are not adequate and/or are being installed or modified, this Hearing Conservation Program (HCP) applies to all affected staff.

2.0 SCOPE

This document applies to all OEES personnel who are exposed to 85 dB for an 8-hour time-weighted average (TWA), defined as the "action level."

3.0 PROGRAM RESPONSIBILITIES

3.1 HEALTH AND SAFETY COORDINATOR (HSC) OR SITE HEALTH AND SAFETY COORDINATOR (SHSC)

The HSC or SHSC will:

- inform the staff of who must wear hearing protectors and issues the equipment
- replace hearing protectors as necessary
- maintain records of equipment issuance
- provide training in the use and care of hearing protectors
- stock a variety of hearing protectors for employees to choose from
- notify management and supervisors of those employees who must wear hearing protectors due to a standard threshold shift or a job assignment in an area where the noise level exceeds 85 dB
- conduct or arrange for noise surveys to determine sound levels in excess of 85 decibels and recommends engineering control measures to greatly reduce or eliminate noise problems
- report any noise problems and/or employee threshold shifts to the CHSD
- evaluate effectiveness of the HCP

3.2 CORPORATE HEALTH AND SAFETY DIRECTOR (CHSD)

The CHSD will:

- ensure that this program is in compliance with federal and state regulations
- make monitoring instruments available to employees
- be available to perform noise surveys
- be available to train HSCs in all aspects of hearing protection equipment and issuance
- make or approve written changes to standard operating procedures (SOPs)

3.3 FIELD OR PROJECT MANAGER OR SUPERVISOR

The Field Manager (FM), Project Manager (PM), or Supervisor will:

- ensure that the employees under their supervision who must wear hearing protectors do so correctly
- inform the HSC when protectors do not perform adequately

3.4 AFFECTED EMPLOYEE

Employees included in the HCP are responsible for wearing appropriate hearing protection equipment. Any reusable equipment shall be stored in a convenient and sanitary manner. Earmuffs and molded plugs can be maintained in clean, sanitary condition with treated towelettes, which may be obtained from the HSC. The user shall not loan, transfer, or exchange hearing protection devices with another person. Users shall guard against damage to the hearing protective equipment, routinely inspect and properly insert or wear the equipment, and report any apparent defect or malfunction to their HSC or SHSC.

Defective equipment must be turned into the HSC or SHSC for repair or replacement. Reusable hearing protective equipment no longer in use shall be returned to the HSC.

4.0 MONITORING

4.1 PURPOSE

The purpose of the occupational noise monitoring program is to:

- collect data to identify areas where occupational noise is above the action level of 85 decibels and therefore unacceptable
- identify employees for inclusion in the HCP by virtue of their job assignment in an identified noisy area or by actual personal dosimeter monitoring data
- enable the proper selection of hearing protection equipment

- provide data that will assist in identifying the type of noise problem and developing an engineered solution for an area of noncompliance

Monitoring shall be repeated whenever a change in operations, equipment, or controls increases noise exposure such that:

- additional employees may be exposed at or above the action level

- the ability of hearing protectors to attenuate to 90 dB or less is rendered inadequate for employee protection

4.2 MONITORING EQUIPMENT

4.2.1 Area Monitoring

A Type II sound level meter (SLM) (or better) meeting American National Standards Institute (ANSI) standards is the instrument used for representative area monitoring. A SLM is available through the CHSD or regional analytical instrument rental companies. The SLM may be used for measurements only by trained individuals. The CHSD is capable of providing training on the use of this instrument.

The SLM must be calibrated before and after each survey and as often as necessary to ensure measurement accuracy.

4.2.2 Personal Monitoring

An ANSI-approved noise dosimeter is the monitoring equipment used to determine the actual employee noise dose. The dosimeter must be worn by the employee throughout the work shift. The data from the dosimeter indicates the integrated time-weighted average noise dose for the monitored worker. Dosimeters are also available through the CHSD or regional analytical instrument rental companies. The CHSD is capable of providing training on the use of this instrument. Dosimeters must be carefully calibrated before and after sampling occurs.

In cases of high worker mobility, significant variation in sound level, or a significant contribution by impulse noise, personal monitoring is the monitoring method required to determine regulatory compliance over area monitoring.

4.3 EMPLOYEE NOTIFICATION

Each employee shall be notified if they have been exposed to noise at or in excess of 85 dB for an 8-hour TWA.

4.4 OBSERVATION OF MONITORING

The employee or his or her representative shall have the opportunity to observe any noise measurements conducted as part of this program.

5.0 AUDIOMETRIC TESTING PROGRAM

As described in the OEES Corporate Health and Safety Manual, Volume III, Medical Surveillance Program, baseline and annual audiometric testing is conducted on all personnel whose job assignments may expose them to 8-hour TWA noise levels at or in excess of 85 dB.

5.1 TESTING PERSONNEL

Audiometric testing will be performed by a licensed or certified audiologist, otolaryngologist, other physician, or by a technician who is certified by the Counsel of Accreditation of Occupational Hearing Conservation, or who has satisfactorily demonstrated competence in testing, interpreting results, and handling equipment.

5.2 STANDARD THRESHOLD SHIFT

Definition – A standard threshold shift is defined as a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000, and 4000 Hertz (Hz) in either ear.

5.3 AGING CORRECTION

In determining whether a standard threshold shift has occurred, allowances may be made for the contribution of aging (presbycusis) to the change in hearing level. The OEES Medical Care Provider will make these corrections according to the procedure in

Calculations and Application of Age Corrections to Audiograms, 29 CFR 1910.95, *Occupational Noise Exposure*, Appendix F.

5.4 BASELINE AUDIOGRAMS

At the time of the baseline medical examination or within 6 months of assignment to a job task that could possibly involve exposures to an 8-hour TWA at or in excess of 85 dB, the employee shall undergo baseline testing against which subsequent audiograms will be compared.

- Employees will be notified that the baseline audiogram should be performed when preceded by at least 14 hours without exposure to workplace noise.
- Employees will also be notified to avoid exposure to high levels of non-occupational noise 14 hours immediately prior to the baseline and follow-up testing.

5.5 ANNUAL AUDIOGRAMS

As a part of the company-provided annual physical outlined in the Medical Surveillance Program, Volume III of the Corporate Health & Safety Manual, each employee will have an annual audiogram to be compared to the baseline. The annual audiogram will be performed by a physician or a certified technician as described above for the baseline audiogram. The employee will be informed to avoid occupational and non-occupational sources of noise in excess of 85 dB for at least 14 hours prior to his or her annual audiogram.

5.6 EVALUATION

The audiometric technician or clinical physician will compare the annual audiogram to the baseline and determine if a standard threshold shift has occurred. The OEES Medical Care Provider will notify the HSC of any possible threshold shifts among the staff. OEES will provide additional information if required by the physician or technician performing the evaluation. This notification will be made by notating any hearing limitation on the Physician's Certification of an OEES (Ogden) Employee form. This form is located in Volume III of this manual, Medical Surveillance Program.

If the annual audiogram results demonstrate that a standard threshold shift has possibly occurred, the employee will be retested within 30 days. The results of the retest will be considered to be those of the annual audiogram.

5.7 FOLLOW-UP PROCEDURE

- Notification

  An employee will be notified in writing within 21 days of the determination that a standard threshold shift has occurred.

- Additional Protective Measures

  If the OEES Medical Care Provider determines that the standard threshold shift is work-related or aggravated by work-related noise, the HSC will ensure that the following steps are taken with employees for whom a standard threshold shift has been determined:

  - Those not wearing hearing protection will be fitted with and trained in their care/use. It is important to explain to these individuals that they are required to wear their hearing protection.

  - Those already using hearing protection will be refitted and retrained in their use and care. Hearing protection offering greater attenuation may be selected and issued.

- Nonpersistent Threshold Shifts

  If subsequent audiograms indicate that a previously determined threshold shift is not persistent, the employee will be informed of the new audiometric interpretation.

  The required use of hearing protectors by the employee may be discontinued.

5.8 REVISED BASELINES

The annual audiogram may be substituted for the baseline audiogram when, in the judgment of the physician or technician evaluating the audiograms, the standard threshold shift shown in the annual audiogram is persistent, or the hearing threshold in the annual audiogram shows significant improvement over the baseline audiogram.

6.0 AUDIOMETRIC TESTING REQUIREMENTS

All audiometric testing will be conducted in a medical facility by a licensed physician or certified technician. The conditions and the equipment involved in the testing will comply with the specifications stated in federal or state OSHA regulations. A brief summary of the regulatory stipulations are summarized below.

6.1 TEST CONDITIONS

Audiometric testing must be pure tone, air conduction, hearing threshold examination, with test frequencies including at a minimum 500, 1000, 2000, 3000, 4000, and 6000 Hz. Each ear will be tested separately at the specifically defined frequencies.

6.2 EQUIPMENT TESTING

The audiometric testing equipment must meet ANSI and OSHA standards. The examination room where the testing is conducted must also comply with OSHA standards.

- The audiometric testing equipment must be functionally checked daily by the physician or technician performing the test.
- Acoustic calibration of the audiometer must be performed annually by the equipment manufacturer.
- Exhaustive calibration must be performed at least every 2 years in accordance with ANSI standards by the equipment manufacturer.

7.0 HEARING PROTECTORS

OEES will make available hearing protectors to all employees exposed to an 8-hour TWA of 85 dB or greater on the A-scale of measurement (dBA). Typically, the site-specific Health and Safety Plan (HSP) for field projects will indicate when the use of hearing protection is required. There may also be situations when noise exposures were not anticipated by the HSP but are suspected to exist. If a SLM is not immediately available to assess unanticipated noise levels in an employee's work area, then a basic rule of thumb shall be followed: If you have to shout to be heard within 3 feet of someone then the noise level is at least 85 dBA.

Hearing protection generally protects from noise levels over all frequencies, but most devices provide more high frequency protection to the wearer. Since speech is partly a low frequency noise, communication between coworkers is not typically hindered by the use of earplugs.

7.1 FOAM INSERT

Attachment 1, Anatomy of the Ear, may be useful in guiding the reader through the following sections of this SOP.

7.1.1 How to Roll Foam Ear Insert

Hands and insert should be clean prior to insertion. Begin by rolling the ear insert slowly into a very thin crease-free cylinder. The earplug when rolled should be compressed into a tight cylinder, not twisted, folded, or creased. To accomplish crease-free rolling, squeeze your fingertips slowly and lightly and progressively apply more pressure as the plug becomes more tightly compressed. Attachment 2 provides a diagram of how to roll a foam ear insert.

7.1.2 Inserting Foam Earplugs

Once the earplug is correctly rolled, immediately insert it into the ear canal. Fitting is easier if the outer ear (a.k.a. auricle or pinna) is pulled outwards and upwards by the hand on the opposite side of the ear (by reaching over or behind the head and gently grasping the pinna) into which the plug is being inserted. Plugs should be inserted into the right ear using the right hand and the left ear using the left hand. Persons with larger ear canals may find it necessary to hold the earplugs in place with a fingertip for a few moments until the plug begins to expand and block the noise. Once a plug has been inserted and starts to expand, pushing and twisting will not improve its fit. If the initial fit is inadequate, remove the earplug, re-roll and try again. Each individual's ear canal will differ in shape. Because of this, some individuals may find a better fit by pulling the pinna upward and outward and others may find a better fit by pulling the pinna backward and outward. Attachment 3 demonstrates the proper insertion technique for foam ear inserts. Attachment 4 shows improper insertion techniques.

7.1.3 Assessing the Fit of Foam Ear Inserts

Roughly one-half to two-thirds of a foam ear insert should fit into the ear canal once the earplug is in place. The exact amount depends on the shape and size of the individual's ear canal. There are several different ways to assess the fit of a foam earplug: by visual and/or fingertip inspection of the position of the earplug, assessment of noise differences when the earplugs are in place, assessment of fit when the earplugs are in place, checking the shape of the plug after it has been removed, and evaluating the occlusion effect. Attachment 5 shows the correct placement of foam ear inserts.

- Visual/Fingertip Inspection of Earplugs - The HSC/SHSC can visually inspect the earplug or the wearer can check with their fingertips to determine whether the end of the earplug is resting beyond the tragus and in the concha (see Attachment 1, Anatomy of the Ear). If the outer end of the earplug is flush with or slightly inside the tragus, it is likely that at least half of the plug is in the canal and the fit is correct. If most of the plug projects into the concha, the insertion is probably too shallow. This method should only be used as a rough indicator because tragus-to-ear canal dimensions vary significantly. Attachment 6 shows an example of a proper fit.

- Assessment of noise reduction while the earplugs are in place - Once the earplugs are inserted, the wearer should, in a steady noise area, tightly cup his or her hands over the ears briefly and then remove them. When properly fitted, the noise levels should seem nearly the same whether or not the ears are covered. If the noise level is dramatically different upon removal of the hands, the earplugs are most likely not working sufficiently.

- Assessment of fit when the earplugs are in place - Once in place, pull slightly on the earplugs to verify the resistance of the pneumatic seal. Slightly pull, twist, and push on the plug. If the wearer does not feel as if he or she is "going up and down in an airplane" it is likely that the seal is not sufficient.

- Checking the shape of the earplug after it has been removed - Either the wearer or the HSC/SHSC can remove the plug from the ear once it has expanded for at least one minute. For a few seconds following removal, the earplug should retain the shape of the ear canal. Examination of the molded plug should show that at least one-half of it was in the ear canal and that it was not squashed, creased, or wrinkled. Attachment 7 shows an example of assessing insertion technique by this method.

- Evaluating the occlusion effect - Wearers often complain about the occlusion effect of hearing protectors. This effect, which is a result of blockage of the ear canal, causes a wearer's perception of their own voice and body sounds to be distorted. The distortion can be described as a boomy, hollow, resonant sounding voice and an exaggerated awareness of chewing, breathing, footfalls, and other body movements. When earplugs are properly and deeply inserted the occlusion effect is reduced, but not eliminated. To assess fit, the wearer can count aloud with only one ear correctly fitted. The voice should be more strongly heard or felt in the occluded ear. It this does not occur, the plug should be reseated or resized. When the second ear has been fitted, the effect should be the same in both ears, with the voice seeming to emanate from the center of the head. Workers should be alert to times when the occlusion effect is more pronounced and adjust their earplugs appropriately. If there is no occlusion effect, however, it is likely that the earplug is not adequately inserted.

7.1.4 Removal of Foam Ear Inserts

Earplugs should always be removed gradually by gently twisting and pulling on the insert because sometimes a "vacuum" condition can develop and when released suddenly, can injure or cause pain in the wearer's ear. Occasionally, wearers with large ear canals may push an earplug in so deep that it becomes difficult to grasp and remove. If this should occur, the SHSC/HSC should use a small tool, such as a pair of tweezers, to carefully grip the end of the earplug and remove it. If the earplug cannot be readily removed, seek medical attention. Persons that experience this should roll the earplug into the shape of a golf tee or use corded earplugs for subsequent uses.

7.2 EARMUFFS

7.2.1 Using Earmuffs

When headband muffs are used, the wearer must also use the crown strap to provide the necessary grip strength. Earmuffs can sometimes exacerbate existing conditions, such as outer ear infections. Before wearing, the HSC or SHSC must visually examine the pinna and behind the pinna for signs of redness, inflammation, or infection. Some types of earmuffs are also made to attach to hardhats. The disadvantage to using this type of earmuff is that it is difficult to adjust the muffs correctly. Larger earmuff cups provide more noise reduction in the middle and low frequency ranges and less protection in the higher frequency ranges. Smaller cups are more effective unless all of the noise energy will be in the lower frequency ranges. Additionally, some people have auricles that are too large for the cups of the earmuffs. In this case, the fit of the cup must be evaluated in comparison to the noise reduction needed since the larger muffs provide less protection.

When wearing earmuffs, the lobule of the auricle must not protrude from the cup of the earmuff. The cushions must be equally deflected on the wearer's head (see Attachment 8). Eyeglass temples can often break the seal of the earmuff. When using a foam earpad (stop-pad) for eyeglasses to reduce the pressure on the temple, the issuer of the earmuff must consider the fact that the stop-pad reduces the noise attenuation by roughly 3 to 5 dB (i.e., the wearer receives a 3-5 dB gain in noise level compared to when the stop-pad is not used). Other situations where the level of hearing protection may be compromised are when the wearer's hair is tucked in between the earmuff and the ear or when the earmuff padding has degraded.

To achieve maximum protection from a hearing protection device, the wearer must avoid taking the muffs off while in noisy areas of the workplace. Flinging the muffs up (when muffs are attached to a hard hat) to communicate with co-workers is an unacceptable practice and results in a reduction of hearing protection provided by the device.

Employees are permitted to mark their earmuffs for identification purposes by using stickers or ink or paint products, but they must do nothing to compromise the quality of protection provided by the earmuffs. Drilling or punching holes into earmuffs is not acceptable.

7.3 SELECTION OF THE APPROPRIATE HEARING PROTECTION DEVICE

Employees included in the HCP who require hearing protection to perform their job duties shall be offered a minimum of two different types of earplugs and one type of earmuff (if the noise levels and frequency ranges are appropriate for earmuffs). The HSC/SHSC will complete a Hearing Protector Fitting and Use form (Attachment 9) to document issuance.

7.3.1 Deciding Whether To Use Muffs or Plugs

When the noise exposure will be mainly low frequency energy in the range of 125 to 200 Hz, ear muffs are not a good choice. Ear muffs are satisfactory when used to protect from mid-frequency ranges. When it is necessary to identify the location of alarms on control panels or in work areas, earplugs are considered the better form of protection. In general, earplugs are more effective than muffs. Also, earmuffs do not fit everyone. Some people may have to wear earplugs regardless of whether they may have a preference for earmuffs.

Workers must also use caution when considering using dual hearing protection devices. An earplug that provides 25 dB of protection, worn with earmuffs that provide 25 dB of protection, do not provide a total of 50 dB of protection. The combination of both muffs and plugs should only be considered when noise levels meet or exceed roughly 105 dB.

7.3.3 Description of Suggested Equipment

- EAR Ultrafit Plugs with or without cord #304-4002 (or equivalent)
- EAR Foam Insert Plugs with or without cord (or equivalent)
- EAR EZ Fit (for smaller ear canals) with or without cord (or equivalent)
- EAR Muffs #1000 (or equivalent)
- EAR Muffs #1000H (or equivalent) for hardhat attachment

- Howard Leight Max Foam Insert Plugs

- Howard Leight Max Lite Foam Insert Plugs

- Willson Sound Barrier Ear Muffs #390 for hard hat attachment

7.4 DISCARDING HEARING PROTECTION DEVICES

Hearing protection devices should be discarded when they have lost their original resiliency or show signs of any of the following:

- Cracking
- Breaking
- Stiffening
- Soiling that cannot be cleaned by washing
- Holes

7.5 HEARING PROTECTOR ATTENUATION

7.5.1 Noise Reduction Rating

All hearing protectors available have been evaluated for attenuation using the Noise Reduction Rating (NRR). The NRR number appears on the equipment packaging. The NRR is the number of decibels the hearing protector absorbs if worn properly. The NRR for hearing protection devices is established based upon laboratory conditions and rarely holds true in field situations. Additionally, improper hearing protection device use by employees lowers the stated NRR values for a particular hearing protection device. Because of this, a more reasonable use of these ratings would be to decrease the NRR value by half.

7.5.2 Evaluation of the Adequacy of Hearing Protection Devices

Hearing protection issued must attenuate employee exposure to an 8-hour TWA of 90 dB or below. For employees who have experienced a standard threshold shift, hearing protector attenuation must be sufficient to reduce employee exposure to a TWA of 85 dB or below. It is important not to select hearing protection devices with a greater noise reducing capacity than necessary as this can hinder one's ability to work at maximum efficiency.

To determine compliance with OSHA standards and effective employee exposure when hearing protection is worn, measurements can be collected using a Type II SLM or better, using the C-weighting scale, and the following equation (the **results** are in the A-weighting scale):

$$dBC - NRR_A = dBA$$

where:

dBC = workplace noise level measured on the C-weighted scale, in dB

NRR_A = Actual Noise Reduction Rating of the hearing protection device being worn (NRR÷2)

dBA = Effective employee exposure on the A-weighted scale, in dB

Note: If measurements of workplace noise levels are only available in the A-weighted scale, then the OSHA 7 dB correction factor must be used (refer to the OSHA noise standard for this procedure).

The adequacy of hearing protector attenuation will be reevaluated by the HSC or SHSC each time noise levels increase to the extent that the hearing protector may no longer be adequate to provide the necessary attenuation. Hearing protection with a higher NRR may be issued as necessary.

8.0 TRAINING PROGRAM

OEES has developed a HCP that is in place everywhere that the noise exposure is at or above an 8-hour TWA of 85 dB. All employees whose job tasks bring them into contact with a work area in excess of the noise levels described participate in the program and receive training. Hearing conservation training is covered in two training outlines included in the Training Program, Volume IV of this manual (Hearing Conservation Program and Hazardous Waste Operations and Emergency Response).

8.1 TRAINING RESPONSIBILITIES

The HSC/SHSC is responsible for arranging for or conducting training and for maintaining records of all HCP training.

8.2 COURSE CONTENT

The Hearing Conservation training session will elaborate upon the following topics:

- Effects of noise on hearing (include detailed explanation of impact of hearing loss and ease of protection and prevention)
- Purpose of hearing protection devices; the advantages, disadvantages, and attenuation of various types; and instructions on selection, fitting, use, and care
- Evaluating the effectiveness/fit of hearing protection devices
- Purpose of audiometric testing
- Explanation of audiometric test procedures
- Hearing Conservation Program

8.3 COURSE HANDOUTS/BOOKLETS

Course outlines, videotapes, and instruction booklets are available through the CHSD.

9.0 ACCESS TO INFORMATION

A copy of this SOP is available to any employee representative. A copy of the state and federal standard is available from the HSC or SHSC.

Training and equipment issuance records will be maintained by the HSC or SHSC. These records will be made available to OSHA inspectors upon request.

10.0 RECORD KEEPING

10.1 NOISE EXPOSURE MEASUREMENTS

Records of noise surveys, including date, instrument identification, calibration information, name of surveyor, maps/drawings, and data should be on file with the HSC/SHSC. These records will be retained for a minimum of 2 years.

10.2 AUDIOMETRIC TESTS

OEES's Medical Care Provider will maintain a record of all audiometric testing conducted as part of this and the OEES Medical Surveillance Program. For the sake of employee confidentiality, actual audiograms will be retained at the physician's office where the testing occurred. The HSC will receive a statement signed by the physician or technician who performed the testing that indicates the state of an employee's hearing. The HSC must inform the employee within 30 days of receipt of information indicating a hearing loss. Precautionary measures will be discussed with the employee.

These records will be retained for the duration of the employee's employment plus thirty years, as is normal for all medical records.

10.3 HEARING PROTECTOR ISSUANCE

A Hearing Protector Fitting and Use Form (Attachment 9) will be completed and maintained in employee personnel files.

11.0 EVALUATING THE PROGRAM'S EFFECTIVENESS

The Hearing Conservation Program Effectiveness Checklist (Attachment 10), completed by the HSC/SHSC, is one method of evaluating the effectiveness of the program.

12.0 REFERENCES

3M. 1994. Administrative Guide to Hearing Conservation. October.

Berger, E.H. and Gasaway, D.C. 1995. Intensive Short Course: Hearing Protection and Hearing Conservation. Cabot Safety and E·A·R. September 28.

Cal-OSHA. 1994. Title 8, Group 15, Article 105, *Occupational Noise Exposure*.

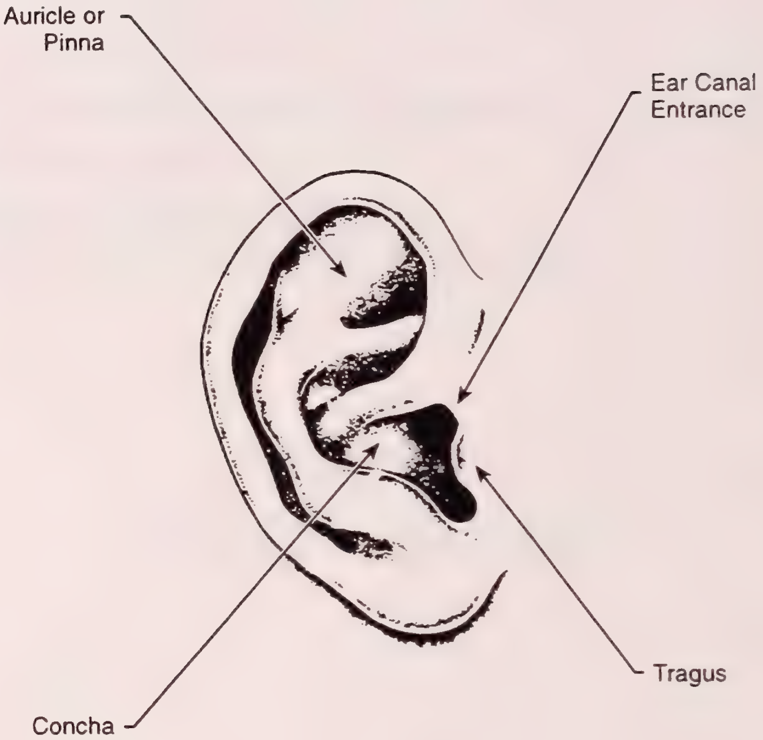
Fed-OSHA. 1995. 29 CFR 1910.95, *Occupational Noise Exposure*.

13.0 ATTACHMENTS

1. Anatomy of the Ear
2. How to Roll a Foam Insert
3. Proper Insertion Technique of Foam Insert
4. Improper Insertion Technique of Foam Insert
5. Correct Placement of Foam Insert
6. Assessing the Fit of Foam Insert
7. Assessing the Insertion Technique of Foam Inserts
8. Assessing the Fit of Earmuffs
9. Hearing Protector Fitting and Use Form
10. Hearing Conservation Program Effectiveness Checklist

ATTACHMENT 1

ANATOMY OF THE EAR



SOURCE: E•A•R Cabot Safety Corporation, "How to Make Sure You Get the Best Fit from Your E•A•R Plugs" Pamphlet

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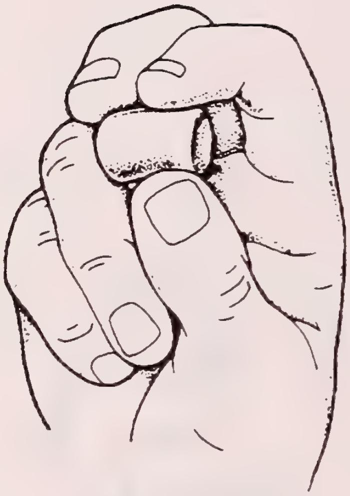
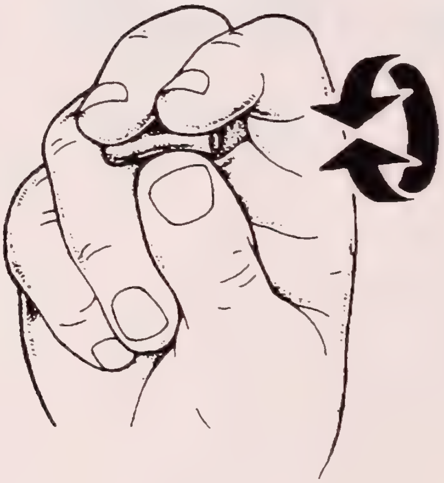
Anatomy of the Ear

ATTACHMENT 2

HOW TO ROLL A FOAM INSERT





SOURCE: E•A•R Cabot Safety Corporation, "How to Make Sure You Get the Best Fit from Your E•A•R Plugs" Pamphlet

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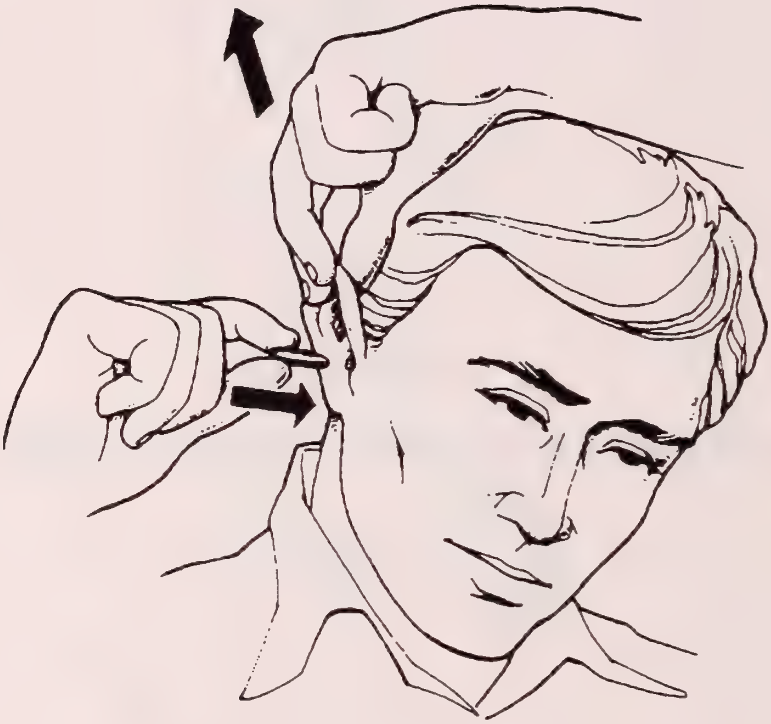
How to Roll a Foam Insert

ATTACHMENT 3

PROPER INSERTION TECHNIQUE OF FOAM INSERT



SOURCE: E•A•R Cabot Safety Corporation, "How to Make Sure You Get the Best Fit from Your E•A•R Plugs" Pamphlet

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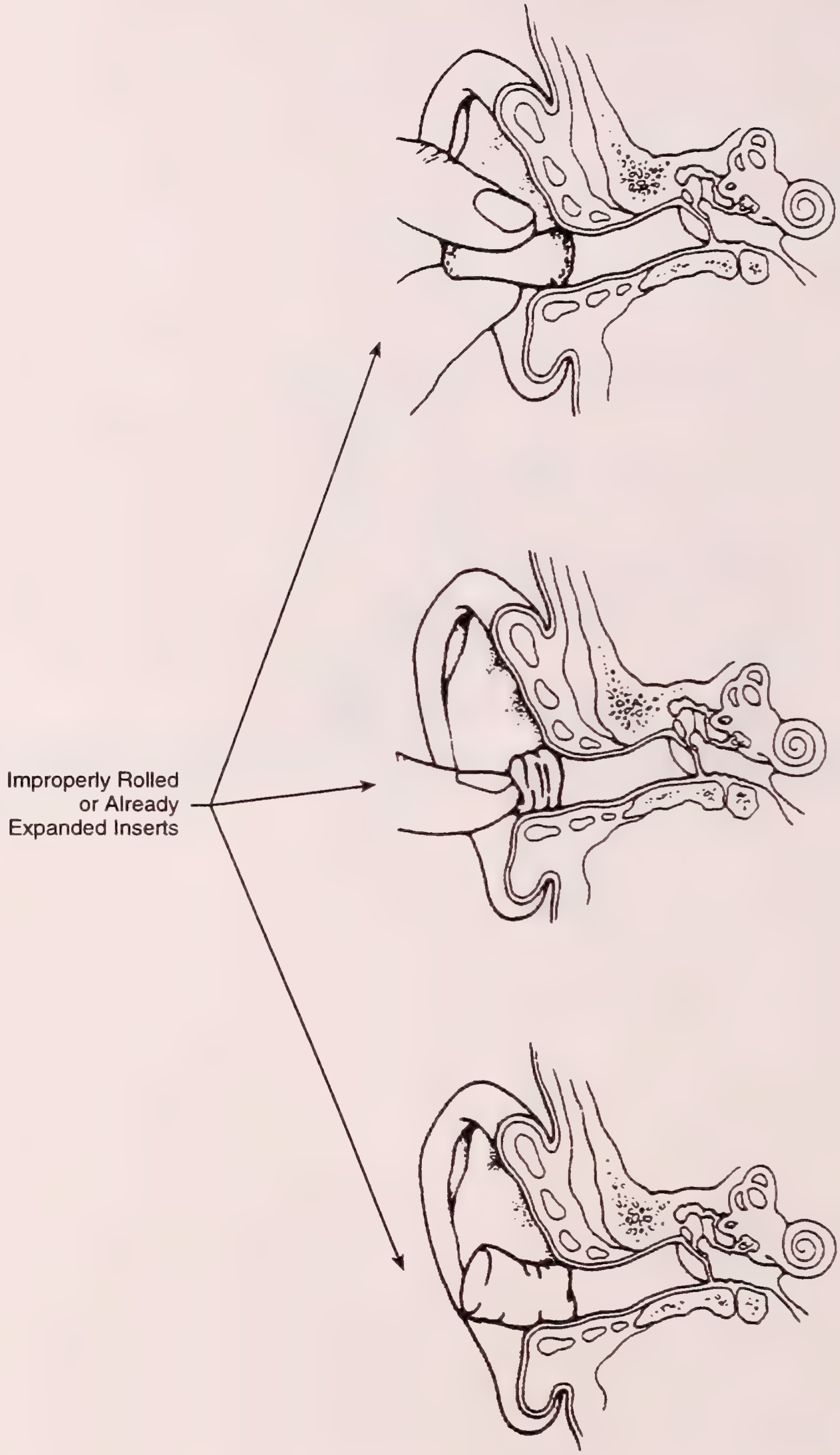
Proper Insertion Technique of Foam Ear Insert

ATTACHMENT 4

IMPROPER INSERTION TECHNIQUE OF FOAM INSERT

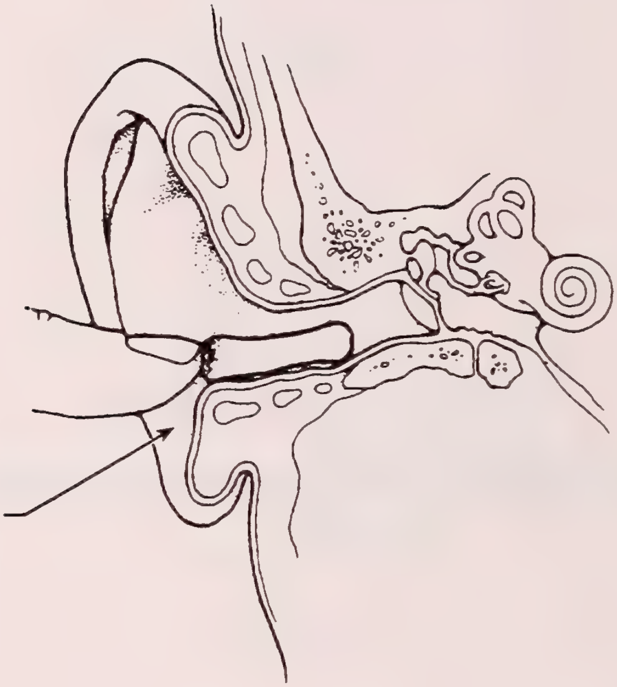


SOURCE: E•A•R Cabot Safety Corporation, "How to Make Sure You Get the Best Fit from Your E•A•R Plugs" Pamphlet

Improper Insertion Technique of Foam Insert

ATTACHMENT 5

CORRECT PLACEMENT OF FOAM INSERT



Foam insert is flush with tragus and does not project too far into the concha. Foam insert will expand to seal the canal.

SOURCE: E•A•R Cabot Safety Corporation, "How to Make Sure You Get the Best Fit from Your E•A•R Plugs" Pamphlet

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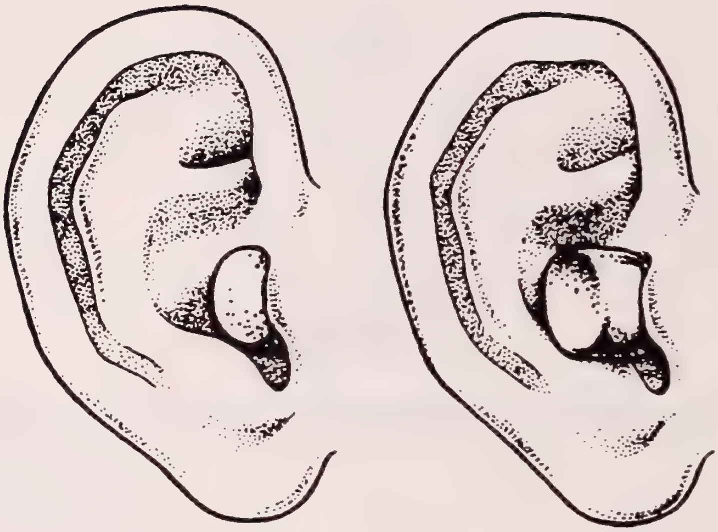
Correct Placement of Foam Insert

ATTACHMENT 6

ASSESSING THE FIT OF FOAM INSERT

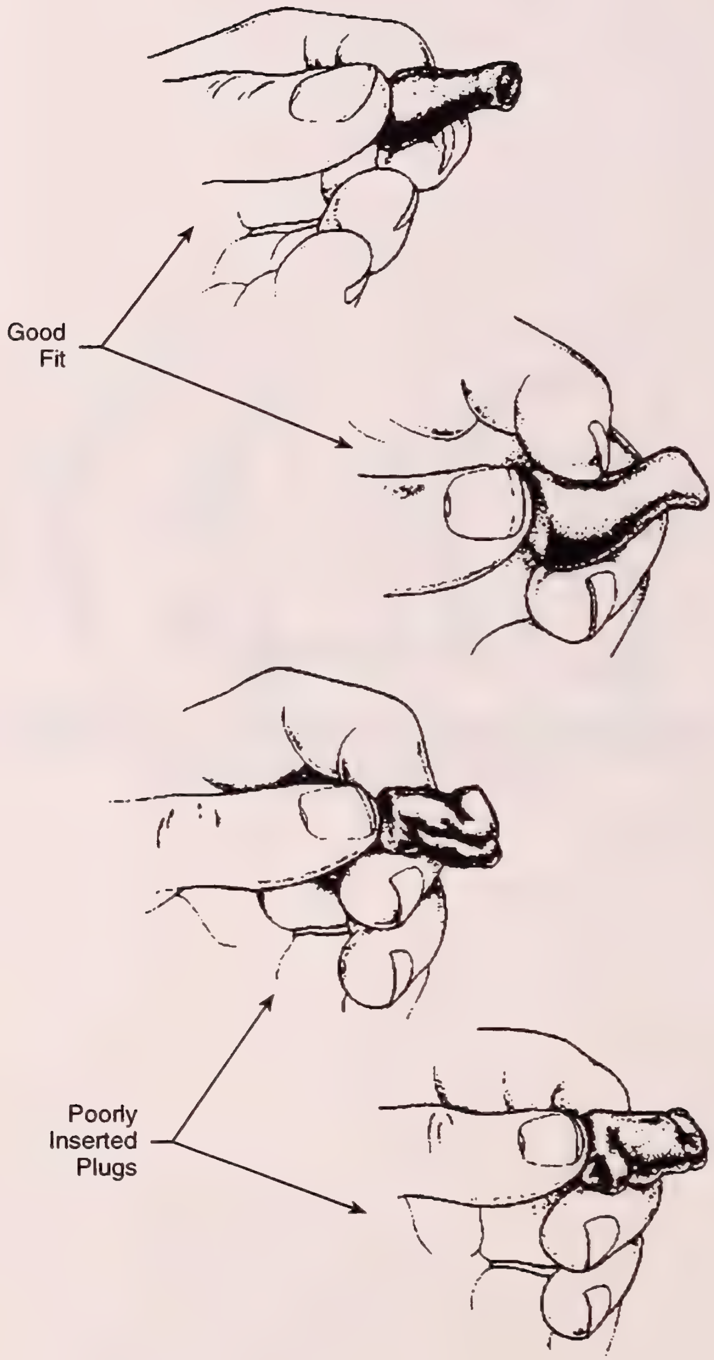


Proper Improper

SOURCE: E•A•R Cabot Safety Corporation, "How to Make Sure You Get the Best Fit from Your E•A•R Plugs" Pamphlet

ATTACHMENT 7

ASSESSING THE INSERTION TECHNIQUE OF FOAM INSERTS

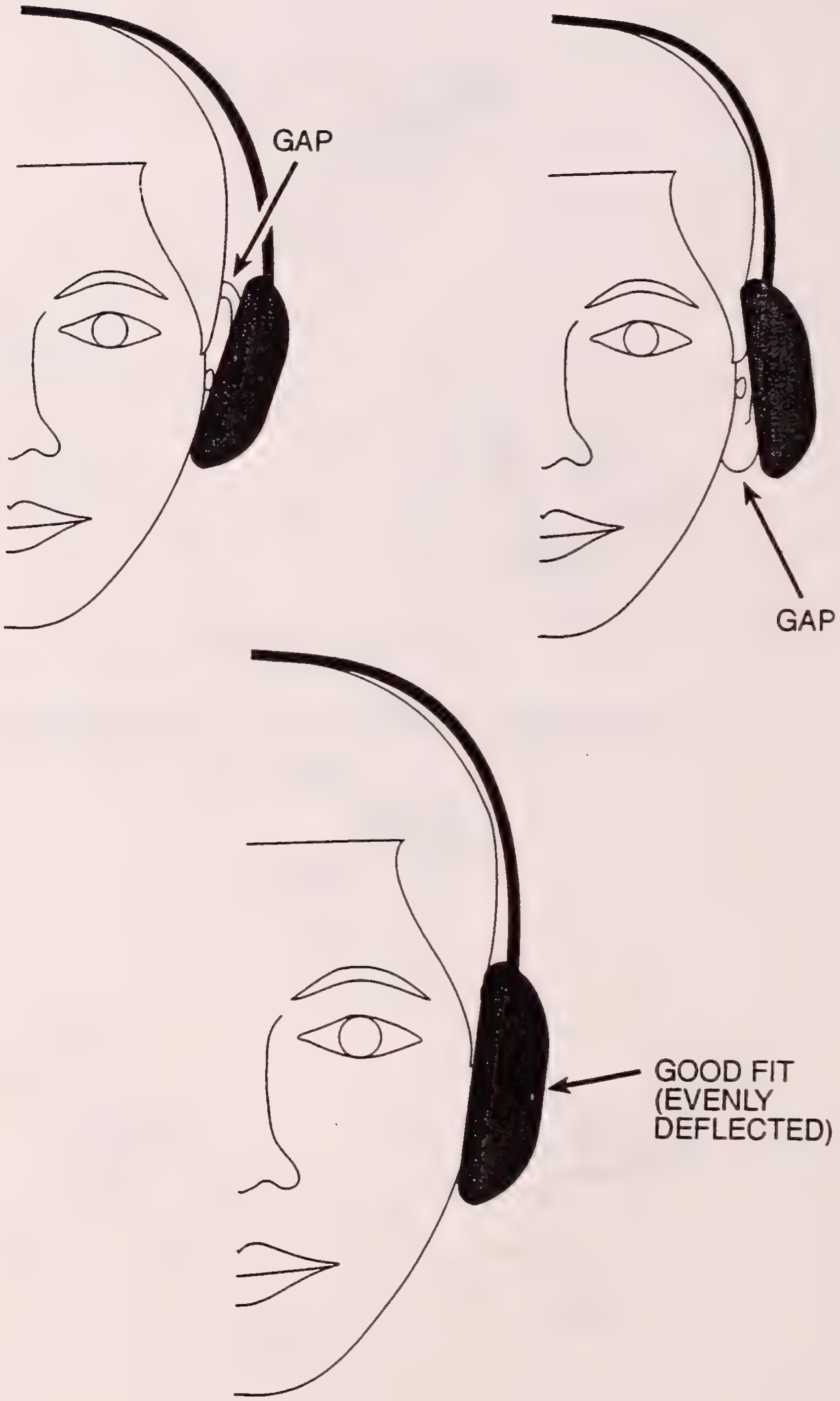


SOURCE: E•A•R Cabot Safety Corporation, "How to Make Sure You Get the Best Fit from Your E•A•R Plugs" Pamphlet

Assessing the Insertion Technique of Foam Inserts

ATTACHMENT 8

ASSESSING THE FIT OF EARMUFFS



Assessing the Fit of Earmuffs

ATTACHMENT 9

HEARING PROTECTOR FITTING AND USE FORM

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HEARING PROTECTOR FITTING AND USE FORM

Employee name:	Social Security No.:	Job title:

Work Area:

Date of last noise monitoring:

Noise exposure: ________________ dBA

Area Monitoring ☐ Personal Monitoring ☐

Date and results of external otoscopic inspection (external ear):

HEARING PROTECTOR

Minimum noise attenuation required _________________ dB

Type: Manufacturer: Model:

Date issued:	Size: Left Right	Fitted and trained by:

Dates hearing protectors inspected:					

Dates and method(s) by which attenuation checked:

Frequency of use (always, sometimes, or never):

Comments:

ATTACHMENT 10

HEARING CONSERVATION PROGRAM EFFECTIVENESS CHECKLIST

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HEARING CONSERVATION PROGRAM EFFECTIVENESS CHECKLIST

To achieve optimal results, the following checklist should be used for the issuance, inspection, and maintenance of hearing protectors:

		YES	NO
1.	Hearing protectors are available to all employees exposed above the 85 dBA action level.	☐	☐
2.	Hearing protectors are worn by all employees exceeding the 90 dBA PEL. Hearing protectors are worn by those exposed over a TWA of 85 dBA who have not yet had baseline audiograms or who have incurred a standard threshold shift.	☐	☐
3.	Employees are properly trained in the selection, fitting, use, and care of Hearing Protection Devices (HPDs). Employees are motivated to wear the devices.	☐	☐
4.	Employees are given a sufficient variety of protectors from which to choose.	☐	☐
5.	The HPDs are sized when necessary. HPDs are fitted carefully with special attention to employee comfort.	☐	☐
6.	Employees are instructed in the proper hygiene requirements for their specific devices.	☐	☐
7.	Employees are trained at least once a year.	☐	☐
8.	Those who issue hearing protectors and counsel employees are trained and competent in these tasks.	☐	☐
9.	Regular audits are made to ensure employee compliance with the company's hearing protector policies.	☐	☐
10.	Workers who are required to wear protectors wear them for the entire time they are exposed to hazardous noise.	☐	☐
11.	For employees who use disposable plugs, replacements are readily available.	☐	☐
12.	Protectors are inspected regularly for signs of age and wear. They are replaced when necessary.	☐	☐
13.	Employees receive periodic external otoscopic inspections to see if there are any problems with the external ear that would contraindicate the wearing of hearing protectors.	☐	☐
14.	Employees receive special counseling with regard to hearing protection when their audiograms show progressive hearing loss.	☐	☐
15.	Employees are encouraged to take their hearing protectors home for use during noisy yard work and hobbies.	☐	☐
16.	The effectiveness of the hearing protection is re-evaluated periodically.	☐	☐

OGDEN ENVIRONMENTAL AND ENERGY SERVICES

STANDARD OPERATING PROCEDURE

S.O.P. NO. H-12	PAGE 1 OF 16
EFFECTIVE DATE 10/1/96	REVISION NO. 0
APPROVAL Denise L. Doggett, CIH	

TITLE

PERSONAL PROTECTIVE EQUIPMENT

1.0 PURPOSE

The purpose of this procedure is to inform OEES personnel of the requirements of and methods for the selection, use, and maintenance of Personal Protective Equipment (PPE). The objectives include:

- Ensuring corporate compliance with federal OSHA regulations in 29 CFR and applicable state regulations
- Minimizing the risk of human injury and illness caused by exposure to chemical, physical, biological, and energy hazards that may be encountered at a project site
- Reducing potential corporate liability incurred by employees using inadequate or improper PPE.

See also OEES SOPs H-13, *Respiratory Protection* , A-7, *Personal Protective Equipment Issuance*, and H-7, *Facial Hair Policy*.

2.0 SCOPE

This procedure applies to all OEES personnel and subcontractors who may work on or visit OEES jobsites and applies to all projects and activities that may require the use of PPE.

3.0 DEFINITIONS

ACGIH - American Conference of Governmental Industrial Hygienists.

Action Level - Specifications taken based on instrument readings. Specific actions may include upgrading/downgrading levels of protective equipment, stopping work, or evacuating a site.

Field Activities - Activities performed by any employee of OEES (e.g. environmental scientist, engineers, marine scientists, archaeologists, air quality specialists, biologists, etc.) at a field site. Field activities generally include, but are not limited to, such tasks as soil boring and sampling, well installation and sampling, underground storage tank (UST) removal, wastewater sampling, building and facility sampling and decommissioning, soil excavation, and construction and operations of soil and ground-water treatment systems. Other field activities may include site visual inspections for lead-based paint, asbestos, polychlorinated biphenyls (PCBs), and/or other contaminants; air monitoring; and onsite analyses of soil, ground water, and air samples.

Field Work - Work performed as part of field activities and at a site away from the main office. Field work is generally performed outdoors but may take place within site buildings and facilities.

Immediately Dangerous to Life or Health (IDLH) - Conditions that pose an immediate threat to life or health (toxic, explosive, etc.) or conditions that pose an immediate threat of severe exposure to contaminants such as radioactive materials, which are likely to have an adverse cumulative or delayed effect on health. Also, the maximum concentration from which, in the event of respiratory failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.

Occupational Safety And Health Administration (OSHA) - A division of the U.S. Department of Labor.

Permissible Exposure Limit (PEL) - PELs are set forth in the OSHA Standards 29 CFR 1910 and 29 CFR 1926. As part of the law, they represent the legal maximum airborne concentrations for personal exposure. The PEL list is not updated annually, as is the Threshold Limit Value (TLV; see below) list compiled by ACGIH; therefore, the most current ACGIH TLV list is used rather than the OSHA PEL listing to determine respiratory protection, unless the PEL value (federal, or state where applicable) is more conservative.

Personal Protective Equipment (PPE) - In this SOP, PPE shall refer to protective equipment, protective clothing, and respiratory protection.

Subcontractor - Any other firm contracted to perform services for OEES. Subcontractors generally involved in field projects include, but are not limited to, heavy equipment operation, drilling and well installation firms, geotechnical consultants, analytical firms, and outside health and safety professionals.

Threshold Limit Value (TLV) - The TLV is recommended by the ACGIH and is derived from consensus review. It is reported as a time-weighted average (TWA) airborne concentration for a particular substance. It represents a level that most workers can be exposed to for an 8-hour day (40-hour week) without suffering adverse health effects. The TLV assumes that each 8-hour exposure will be followed by a 16-hour recovery period and that after 5 days, there will be a 48-hour recovery period. The TLV lists are published by ACGIH yearly. Each specific TLV is reviewed at least once every three years to incorporate new scientific information.

4.0 RESPONSIBILITIES

The Project Manager (PM), Health and Safety Manager (HSM), Field Manager (FM), and Site Health and Safety Coordinator (SHSC) are responsible for ensuring compliance of this procedure by all field personnel.

4.1 PROJECT MANAGER (PM)

The PM is responsible for incorporating the requirements of this procedure into project plans, budgets, and activities.

4.2 HEALTH AND SAFETY MANAGER (HSM)

It is the responsibility of the HSM to ensure that this procedure complies with federal and state OSHA guidelines.

4.3 FIELD MANAGER (FM) OR CONSTRUCTION SUPERVISOR (CS)

The FM/CS must ensure that all personnel are aware of the PPE requirements. In addition, he/she must have a plan of action that lists all requirements in the event of a PPE upgrade.

Should a PPE upgrade be necessary, the FM/CS must notify all personnel and visitors and evacuate the work area of the site. The FM/CS oversees all upgrade activities.

4.4 SITE HEALTH AND SAFETY COORDINATOR (SHSC)

The SHSC is responsible for implementing and enforcing this procedure as directed by the HSM during project operations and activities. The SHSC also determines the appropriateness of assigned PPE levels based on site conditions and the results of air monitoring. The SHSC also provides training in the proper use of PPE, ensures that an adequate supply of PPE is available and used by employees, and arranges for proper maintenance, decontamination, storage, and issuance of all required PPE.

4.5 ALL EMPLOYEES

All employees of OEES performing activities that require the use of PPE must comply with this procedure.

4.6 SUBCONTRACTORS

All personnel subcontracted to OEES and working on a field project are subject to the requirements of this procedure along with internal procedures set forth by the subcontracting company.

5.0 PROCEDURE

Appropriate PPE shall be supplied and properly used for all OEES operations where hazardous substances or other hazardous conditions (environmental or operational) may be encountered. Subcontractor personnel shall provide their own PPE and shall maintain adequate supplies onsite for specified levels of protection, including the potential upgrades listed in the site-specific Health and Safety Plan (HSP). The HSM and/or SHSC shall review all subcontractor equipment and ensure that it meets the requirements as specified in the HSP.

The choice of PPE for each project will be based on the specific hazards identified. Hazards will be identified in office or facility situations using a Hazardous Assessment and PPE Selection form (Attachment 1). Field hazards will be identified during preliminary hazard evaluations and site characterizations, as described in Volume II, Comprehensive Field Project Health and Safety Program, of this manual. Heat stress arises when the combination of ambient air temperature, relative humidity, solar load, and wind speed hinder the human body's ability to thermoregulate. Heat stress is also a major hazard for workers wearing chemical-protective clothing, particularly in warm and humid environments. Protective materials that shield the body from chemical exposure also prevent heat and moisture from dissipating. PPE can therefore rapidly create a hazardous condition because the body can no longer thermoregulate properly. Work tasks will be evaluated. Climatic conditions and the level of PPE will be taken into consideration as best as possible to manage heat stress.

Appropriate PPE will be selected in the field project site-specific HSP. The procedures and guidelines for the proper selection and use of PPE follow.

5.1 PROVISIONS FOR PPE

As stipulated in OSHA regulations for PPE (29 CFR, Section 1910.132-1910.137), OEES shall provide employees with protective clothing (i.e., chemical protective pants, hooded jackets and coveralls, gloves, hard hats, hearing protection, respirators, electrical protective equipment, heat/cold stress prevention gear, safety glasses, fall protection, flotation devices, boots) to protect their health and welfare from hazards capable of causing injury or impairment in the function of any part of the body through absorption, inhalation, or physical contact. The provisions for safety-toe footwear and prescription safety eyewear are addressed in SOP A-7, *Personal Protective Equipment Issuance*. The OEES HSM or SHSC will ensure that the PPE is applicable and suitable for the working environment and the specific hazards known or suspected to exist.

5.2 SELECTION OF PPE

Selection of appropriate PPE will be based upon the physical, chemical, biological, and energy hazards present in the work area or onsite after engineering and administrative controls have been considered.

PPE selection is documented in the site-specific HSP (see Volume II, Comprehensive Field Project Health and Safety Program, of this manual for an example) or on a Hazard Assessment and PPE Selection form (Attachment 1).

Levels of protection (A, B, C, D, and Modified D) that comply with 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response*, are selected based upon:

- The type of chemical substance in the ambient atmosphere, its measured concentration, and its toxicity
- The potential for exposure to splashes of liquids, substances in the air, or other direct contact with material while working
- A knowledge of the expected chemicals of concern and their properties, such as toxicity, route of exposure, and so forth

Items such as electrical protective equipment, fall protection equipment, hearing protection, heat and cold stress protection, life jackets, and eye protection, are considered types of PPE, but are not classified as a particular level of protection.

5.3 LEVELS OF PROTECTION FOR HAZARDOUS WASTE SITE WORK

The U.S. Environmental Protection Agency (USEPA) Office of Emergency and Remedial Response specifies four ensembles of protective clothing and equipment for uncontrolled hazardous waste site work (Levels A, B, C, and D). OEES utilizes a fifth level of protection, Level Modified D (Mod. D).

No single combination of protective equipment and clothing can protect against all hazards; therefore, PPE should be used in conjunction with other methods of protection (after administrative and engineering control options have been considered), and its effectiveness should be evaluated periodically.

The levels of protection indicate the degree of protection recommended for generalized categories of hazardous environments and are as follows:

Level A Protection–should be worn when the highest level of respiratory, skin, and mucous membrane protection is needed. Level A is generally used where extremely hazardous substances are known to be present in high atmospheric concentrations and where Level B splash gear does not offer adequate protection against any dermally active substances present or where materials and concentrations are unknown. This level is also used where the absence of conditions requiring Level A have not yet been determined. See Attachment 2 for an example of Level A protection.

- Positive pressure, full-facepiece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH)
- Totally encapsulating chemical-protective suit, taped to boots and gloves
- Coveralls*
- Long underwear*
- Gloves, outer, chemical-resistant
- Gloves, inner, chemical-resistant
- Boots, chemical-resistant, steel toe and shank
- Hard hat (under suit)*
- Disposable protective suit, gloves, and boots (depending on suit construction, may be worn over totally encapsulating suit)

* Optional, as applicable

Level B Protection–should be worn when the highest level of respiratory protection is needed, but a lesser level of skin protection. Level B is generally used in those situations where the chemical is known, the atmosphere is oxygen deficient, no IDLH concentrations of substances that can injure or be absorbed through the skin are present, or the dermal route of exposure is not acutely hazardous. This level of protection is normally the minimum used for initial response or reconnaissance, unless the respiratory hazards allow for a lesser level of respiratory protection than a SCBA. See Attachment 3 for an example of Level B protection.

- Positive pressure, full-facepiece SCBA, or positive pressure supplied air respirator with escape SCBA (NIOSH-approved)
- Hooded chemical-resistant clothing (overalls and long-sleeved jacket, coveralls, one- or two-piece chemical-splash suit, disposable chemical-resistant overalls) taped to boots and gloves
- Coveralls*
- Gloves, outer, chemical-resistant
- Gloves, inner, chemical-resistant

- Boots, outer, chemical-resistant, steel toe and shank
- Boot covers, outer, chemical-resistant (disposable)*
- Hard hat*
- Disposable protective suit, gloves, and boots (depending on suit construction, may be worn over totally encapsulating suit)

* Optional, as applicable

Level C Protection–is composed of skin protection and an air-purifying respirator. Provides adequate protection when the type of airborne substance is known, its concentrations measured, the criteria for using air-purifying respirators are met, and the dermal route of exposure is not acutely hazardous. Use of this level of protection requires continuing measurement of air contaminants to ensure that IDLH concentrations do not arise or exist and that the concentrations of the contaminants present do not exceed the service limits of the respirators. See Attachment 4 for types of Level C respiratory protection.

- Full-face or half-face air-purifying respirator (NIOSH-approved) fitted with appropriate cartridges or filters
- Hooded chemical-resistant clothing (overalls and long-sleeved jacket, coveralls, one- or two-piece chemical-splash suit, or disposable chemical-resistant overalls) taped to boots and gloves
- Coveralls*
- Gloves, outer, chemical-resistant
- Gloves, inner, chemical-resistant
- Boots, outer, chemical-resistant, steel toe and shank*
- Boot covers, outer, chemical-resistant (disposable)*
- Safety glasses or chemical splash goggles*
- Hard hat*
- Escape mask*

- Face shield*

* Optional, as applicable

Various types of air-purifying canisters and cartridges are available for use with air-purifying respirators. Each canister or cartridge will protect against exposure to a specific class of air contaminants. The concentration or dust size limitations for each type of canister are stated on each canister package or box. The canisters currently on the market protect against the following:

- Acid gases
- Hydrocyanic acid gases
- Chlorine gases
- Organic gases
- Ammonia gases
- Organic vapors and acid gases
- Hydrocyanic acid gas and chloropicrin vapor
- Acid gases, organic vapors, and ammonia gases
- Radioactive materials, except tritium and noble gases
- Particulates (dusts, fumes, mists, fogs, or smokes) in combination with any of the above gases or vapors

The HSM and SHSC shall select the proper canister for use with Level C respiratory protection based upon the contaminants known or suspected to occur at the site. SOP H-13, *Respiratory Protection Program*, of this volume of the Corporate Health and Safety Manual provides guidelines on respiratory protection selection.

Level Modified D Protection–is an OEES-specific level of PPE to be worn on sites with dermal skin hazards, but no respiratory hazards. Provides adequate protection when the type of airborne substance is known, its concentrations measured, no protection is required, and the dermal route of exposure is not acutely hazardous. Use of this level of protection requires continuing measurement of air contaminants to ensure that IDLH concentrations do not arise or exist. See Attachment 5 for an example of Level Modified D protection.

- Work shirt and full-length cotton pants or coveralls
- Chemical-resistant clothing (overalls and long-sleeved jacket, coveralls, one- or two-piece chemical-splash suit, disposable chemical-resistant overalls) taped to boots and gloves
- Gloves, outer, chemical-resistant
- Gloves, inner, chemical-resistant
- Boots/shoes, steel toe and shank with chemical-resistant (disposable) boot covers or steel-toed rubber boots
- Safety glasses or chemical splash goggles
- Hard hat*
- Escape mask*
- Face shield*

* Optional, as applicable

Level D Protection–Primarily a work uniform. Should not be worn in any chemically hazardous environment. This level is used when there is no indication of hazardous conditions and the work function precludes contact with any hazardous substance.

- Work shirt and full-length cotton pants or coveralls
- Gloves*
- Boots/shoes, steel toe and shank
- Boots, outer, chemical-resistant (disposable)*
- Safety glasses or chemical splash goggles
- Hard hat*
- Escape mask*
- Face shield*

* Optional, as applicable

5.4 Use of PPE FOR ALL FIELD PROJECTS AND WORK TASKS

For both non-hazardous and hazardous waste field projects and for office or facility work tasks, the SHSC shall ensure that all PPE is used for the specific site conditions and activities for which it was intended and shall enforce all procedures for the use of PPE, as specified in the site-specific HSP. In addition, the SHSC shall ensure that these requirements for using PPE are met:

5.4.1 General Requirements

- No person will be allowed to enter a contaminated area or controlled work zone without the proper PPE, as specified in the site-specific HSP.
- PPE requirements for work in contaminated areas may be downgraded or upgraded only upon approval of the SHSC and/or HSM, or by Action Levels set in the site-specific HSP. Decisions to upgrade or downgrade must be based on environmental monitoring or other conditions that indicate greater or lesser exposure hazards than those originally anticipated.
- Adequate training in proper PPE use will be given to all onsite OEES and subcontractor personnel. The training shall include a summary of correct PPE use procedures; capabilities and limitations of PPE; donning, doffing, cleaning, and fitting PPE; emergency escape procedures; the nature of respiratory and other hazards; and what will happen if PPE is not used properly. Personnel required to wear PPE will also be allowed to wear the equipment in an uncontaminated area to become familiar with it. They should be informed of the warnings that indicate respirator cartridges are saturated or that garments are inoperative. This information is also covered in the Hazardous Waste Operations and Emergency Response (HAZWOPER) course which must be completed before an employee can be assigned to a hazardous waste site.
- All PPE must be checked by the wearer daily before each use and while cleaning it. The user should ensure that it is not cracked, torn, or distorted, has no pinholes, and is in proper working condition.

5.4.2 Head Protection

Hard hats must be worn by employees working in areas where there is a danger of head injury from impact, from falling or flying objects, or from electrical shocks or burns. Helmets for protecting against falling and flying objects shall meet the specifications contained in the American National Standards Institute (ANSI) Z89.1-1986, American National Standard for Personnel Protection - Protective Headwear for Industrial Workers - Requirements. Helmets for protecting against high-voltage electrical shock and burns shall meet the specifications contained in ANSI Z89.2-1971.

5.4.3 Hearing Protection

Hearing protection (i.e., earplugs or muffs), shall be provided and used in identified hazardous noise areas and when using equipment that produces hazardous noise. Ear plugs inserted in the ear shall be fitted individually by a trained person [29 CFR 1926.101(b), *Hearing Protection*] and shall be worn and used in accordance with SOP H-10, *Hearing Conservation Program.*

5.4.4 Eye and Face Protection

Safety glasses shall be provided and used in identified hazardous work zones and when using equipment that creates a reasonable probability of eye injury that can be prevented by wearing such equipment. Safety glasses shall meet the specifications contained in ANSI Z87.1-1989. See also SOP A-7, *Personal Protective Equipment Issuance*, Section 2.2, Safety Glasses (Plano [non-prescription] and Prescription).

5.4.5 Respiratory Protection

- All SCBAs and respirators for emergency uses will be inspected monthly by the SHSC. Records will be maintained for all inspections of emergency-use respirators.
- All personnel required to wear respirators shall receive a physical evaluation in accordance with Volume III, Medical Surveillance Program, to ensure that they have no pre-existing physical or psychological conditions that may preclude them from wearing a respirator (required under regulations outlined in 29 CFR 1910.134, *Respiratory Protection*).

- All workers using respirators must have their respirators qualitatively fit-tested at least once a year. Asbestos, arsenic, cadmium, formaldehyde, benzene, and lead workers must have unique respirator fit-tests in compliance with the standard for the chemical they are exposed to. Fit-testing ensures a proper face-to-facepiece seal [29 CFR 1910.134, 29 CFR 1926.103, *Respiratory Protection*]. The respirator head straps must be comfortable and the user should be able to perform normal and deep-breathing, side-to-side and up-and-down head movements and talking without loosening the seal. The seal will be tested by introducing a chemical with a distinctive odor, such as isoamyl acetate, or an irritant smoke into the immediate air around the individual wearing the respirator. The seal is not adequate if the individual can smell the isoamyl acetate, or experiences eye and upper respiratory tract irritation due to irritant smoke exposure. The individual will not be allowed to use the respirator until a proper seal has been obtained. The Health and Safety Coordinator (HSC) or SHSC shall maintain written fit-test records for all onsite personnel. See also SOP H-13, *Respiratory Protection Program.*

- An individual may not wear a respirator if he/she has a condition that prevents a good seal. Facial hair must not be present between the sealing surface of the respirator and the user's face (see SOP H-7, *Facial Hair Policy*). Corrective lenses that have temple bars or straps that pass between the sealing surface and the user's face may not be worn. Corrective lenses that may be taped to the respirator or inserted inside full-facepiece respirators may be used. Contact lenses may not be used with respirators. Full dentures can be worn with respirators, but partial lower dentures may have to be removed if they interfere with a proper chin seal. It is OEES policy that all personnel working on hazardous waste/substance sites be prepared to immediately upgrade respiratory protection.

5.4.6 Protective Clothing

- The SHSC shall monitor the length of time employees wear protective clothing to prevent heat stress, fatigue, and chemical permeation of the clothing. He/she shall ensure that all procedures for PPE removal, decontamination, and donning are followed during rest breaks. Protective clothing shall be worn according to manufacturer's specifications. For example, Tyvek® coveralls shall not be tied down around the waist because the dangling, tied sleeves could get caught in rotating machinery. Instead, if only pants are desired (and have been approved by the HSP), Tyvek® pants shall be purchased specifically for that purpose and any ties tucked into the pants. Protective clothing will be changed on a regular basis as determined by the SHSC. The duration that the clothing will be worn will be based on permeation data for the clothing material, the contaminant concentration ranges found during environmental monitoring, and working conditions (temperature, humidity, work schedules, etc.) at the site. At a minimum, protective clothing will be disposed of upon removal. To reenter a contaminated area an employee will have to put on new protective clothing.

- All onsite OEES and subcontractor personnel wearing protective clothing shall inspect it while working to ensure that it is not torn, degraded, or covered with residue. If these conditions are noted, the person shall notify the SHSC and institute proper decontamination procedures, in order to change into new protective clothing. Rips and tears should be mended at once, or the worksuit shall be immediately replaced.

5.5 PPE DONNING/DOFFING PROCEDURE

Failure to follow donning and doffing procedures may result in the PPE being ineffective against contaminants. These procedures may be altered by the SHSC if improvements can be made to the procedure and the changes are warranted in the field. Refer to SOP H-6, *Personnel Decontamination*, for general personnel decontamination guidelines.

5.6 PPE MAINTENANCE AND CARE

Reuse of chemical protective clothing will be permitted only if the article is non-porous, the garment has been thoroughly decontaminated, and the possibility of chemicals diffusing through the inside surface is small. Chemical-resistant boots, "splash" suits, and certain special-use gloves are examples of items that may be reused based on their condition after use. OEES personnel will also frequently use items that can be disposed of after a single use or at the end of the workday. These items include gloves, coveralls, shoe covers, and respirator cartridges/filters. Used PPE will be kept onsite for disposal in PPE drums labeled as hazardous waste. In the case of respirators, disinfecting detergents and rinses and/or wipes should be used to decontaminate and hygienically clean the facepieces after each use. After cleaning, the employee must let the respirator air dry in a clean place. After drying, the respirator shall be placed in a resealable plastic bag or clean, sealable storage container or cabinet. All respirators should be stored to protect them from dust, sunlight, heat, extreme cold, excessive moisture, and damaging chemicals.

Respirators will be checked periodically by the SHSC and inspected before each use by the wearer. A respirator maintenance program will be established to repair and/or replace respirator component parts. Replacement parts for respiratory protective devices must be obtained from the manufacturer of the equipment. Substitution of parts from a different brand or type of respirator will not be allowed. SCBA repairs must be performed by the equipment manufacturer.

In the process of donning, each site worker and his/her buddy will examine protective clothing prior to use for imperfect seams, non-uniform coatings, tears, malfunctioning closures, pinholes, cracks, or other signs of deterioration. Any defective equipment should be returned by the SHSC for replacement after notifying procurement. The SHSC will ensure that protective equipment is periodically inspected throughout the workday, and any defective PPE repaired or replaced as needed.

The SHSC shall also ensure that all used protective clothing is disposed of properly and all new protective clothing is stored in an uncontaminated, well-ventilated area. This area must be away from sunlight, direct heat, and moisture. Clothing made of different types of materials will be separated and labeled to prevent use of the wrong material by mistake.

The SHSC will perform onsite maintenance of PPE, such as repair of hard hats or respirators that are discovered to have minor, reversible defects.

Fully-encapsulated suits will be repaired by the manufacturer. Maintenance records for encapsulated suit repairs will be kept by the SHSC or HSC.

6.0 RECORDS

Where applicable, the following documents shall be retained as records:

- Hazard Assessment and PPE Selection form
- Records listing the dates and repairs made to a respirator, will be maintained for each respirator by the individual user, Office HSC, and/or SHSC (see SOP H-13, *Respiratory Protection Program*)

- All field notes, logs, records, and permits pertaining to the selection, use, maintenance, and disposal of PPE

7.0 REFERENCES

American National Standards Institute. Z89.1-1986 and Z89.2-1971, *American National Standard for Personnel Protection-Protective Headwear for Industrial Workers - Requirements.*

Fed-OSHA. 1995. 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response.* March 6.

Fed-OSHA. 1995. 29 CFR 1910.134 and 29 CFR 1926.103, *Respiratory Protection.*

National Institute for Occupational Safety and Health (NIOSH). *Personal Protective Equipment for Hazardous Materials Incidents: A Selection Guide.* U.S. Department of Health and Human Services, Morgantown, West Virginia.

NIOSH/OSHA/USCG/EPA. 1985. *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities.*

Schwope, A.D.; Costas, P.P.; Jackson, J.O.; and D.J. Weitzman. 1985. *Guidelines for the Selection of Chemical-protective Clothing,* Second edition. American Conference of Governmental Industrial Hygienists, Inc., Cincinnati, Ohio.

U.S. Environmental Protection Agency. *Standard Operating Safety Guides.* Washington, D.C.

8.0 ATTACHMENTS

1. Hazard Assessment and PPE Selection Form
2. Example of Level A Protection
3. Example of Level B Protection
4. Types of Air-purifying Respirators for Level C Protection
5. Example of Level Modified D Protection

ATTACHMENT 1

HAZARD ASSESSMENT AND PPE SELECTION FORM

OGDEN

Hazard Assessment and PPE Selection

(Post this Form in the Work Area Where the Task is Routinely Performed)

Task: ______________________________

Department: ______________ Date : __________ Completed by: ______________

HAZARDS IDENTIFIED:
SERIOUSNESS OF INJURY?

Impact (Explain): ______________________
None ☐ Lo ☐ Med ☐ Hi ☐

Penetration: ______________________
None ☐ Lo ☐ Med ☐ Hi ☐

Compression: ______________________
None ☐ Lo ☐ Med ☐ Hi ☐

Chemical: ______________________
None ☐ Lo ☐ Med ☐ Hi ☐

Heat, Hot Surfaces: ______________________
None ☐ Lo ☐ Med ☐ Hi ☐

Harmful Dust: ______________________
None ☐ Lo ☐ Med ☐ Hi ☐

Light Radiation: ______________________
None ☐ Lo ☐ Med ☐ Hi ☐

Falling Objects: ______________________
None ☐ Lo ☐ Med ☐ Hi ☐

Sharp Objects: ______________________
None ☐ Lo ☐ Med ☐ Hi ☐

Rolling or Pinching Objects: ______________________
None ☐ Lo ☐ Med ☐ Hi ☐

Electrical Hazards: ______________________
None ☐ Lo ☐ Med ☐ Hi ☐

Ergonomic/Lifting: ______________________
None ☐ Lo ☐ Med ☐ Hi ☐

Other: ______________________
None ☐ Lo ☐ Med ☐ Hi ☐

Can the task be modified to reduce/eliminate the hazard? Yes ___ No ___ If yes, how? __________

MSDS PPE RECOMMENDATIONS

☐ Gloves, Type: ______________________

☐ Safety-toe Boots

☐ Boot Covers

☐ Hard Hats

☐ Other ______________________

____

☐ Coveralls, Type: ______________________

☐ Apron

☐ Safety Glasses, Goggles, or Faceshield

Type: ______________________

☐ Respirator, Type: ______________________

PPE REQUIRED FOR THE TASK

☐ Gloves, Type: ______________________

☐ Safety-toe Boots

☐ Boot Covers

☐ Hard Hats

☐ Other ______________________

____

☐ Coveralls, Type: ______________________

☐ Apron

☐ Safety Glasses, Goggles, or Faceshield

Type: ______________________

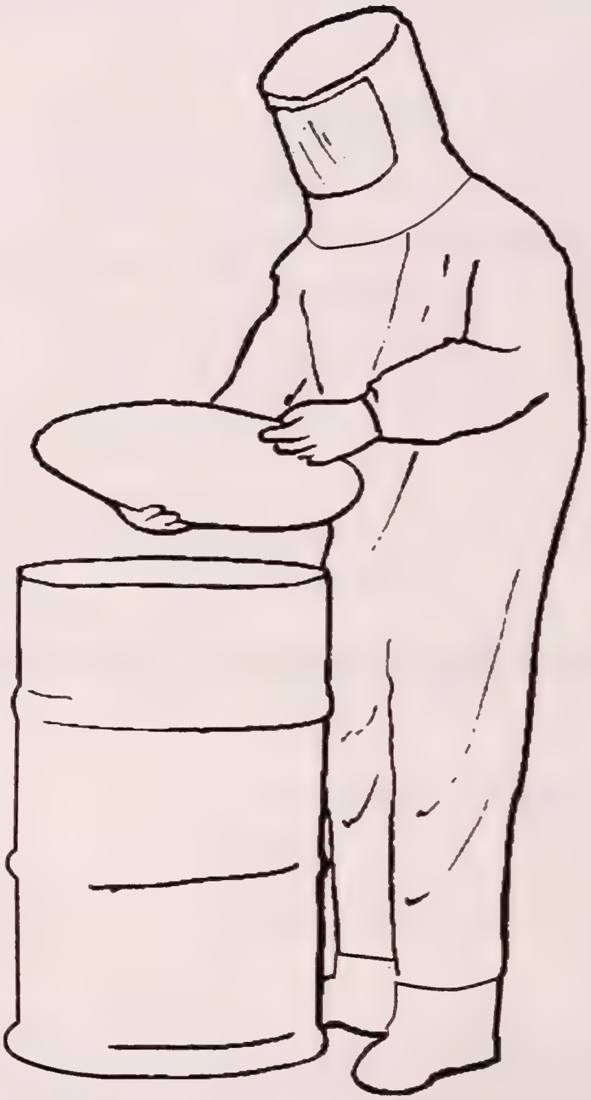
☐ Respirator, Type: ______________________

Training Required for the Task: ______________________

____

ATTACHMENT 2

EXAMPLE OF LEVEL A PROTECTION



Fully-encapsulating suit

Source: NIOSH/OSHA/USCG/EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, 1985*

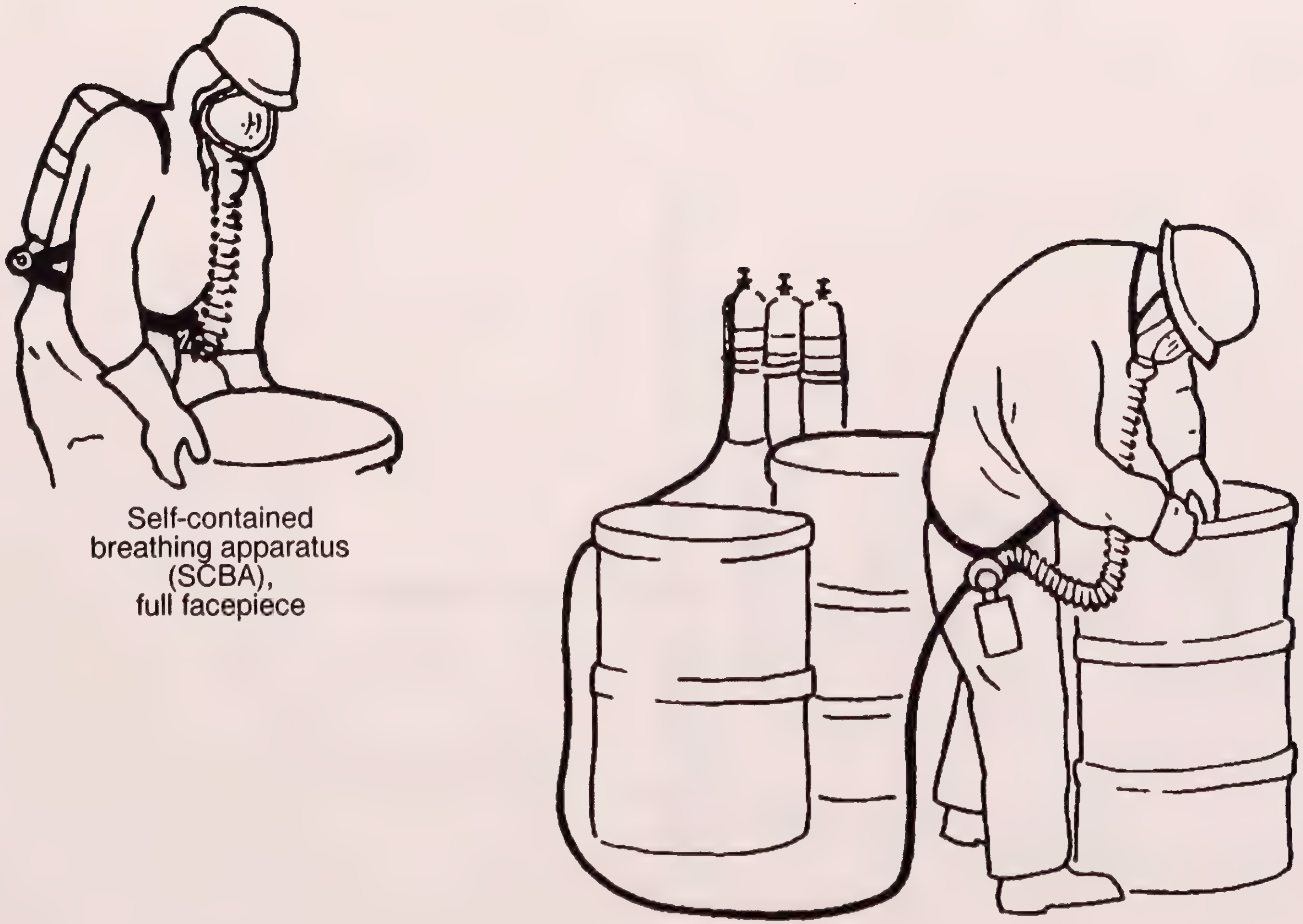
OGDEN

Example of Level A Protection

Filename: e:\Health & Safety\Volume VI Fig (April 96)\Respirators/Clothing\Level A Protective Equip.fh5

ATTACHMENT 3

EXAMPLE OF LEVEL B PROTECTION



Self-contained breathing apparatus (SCBA), full facepiece

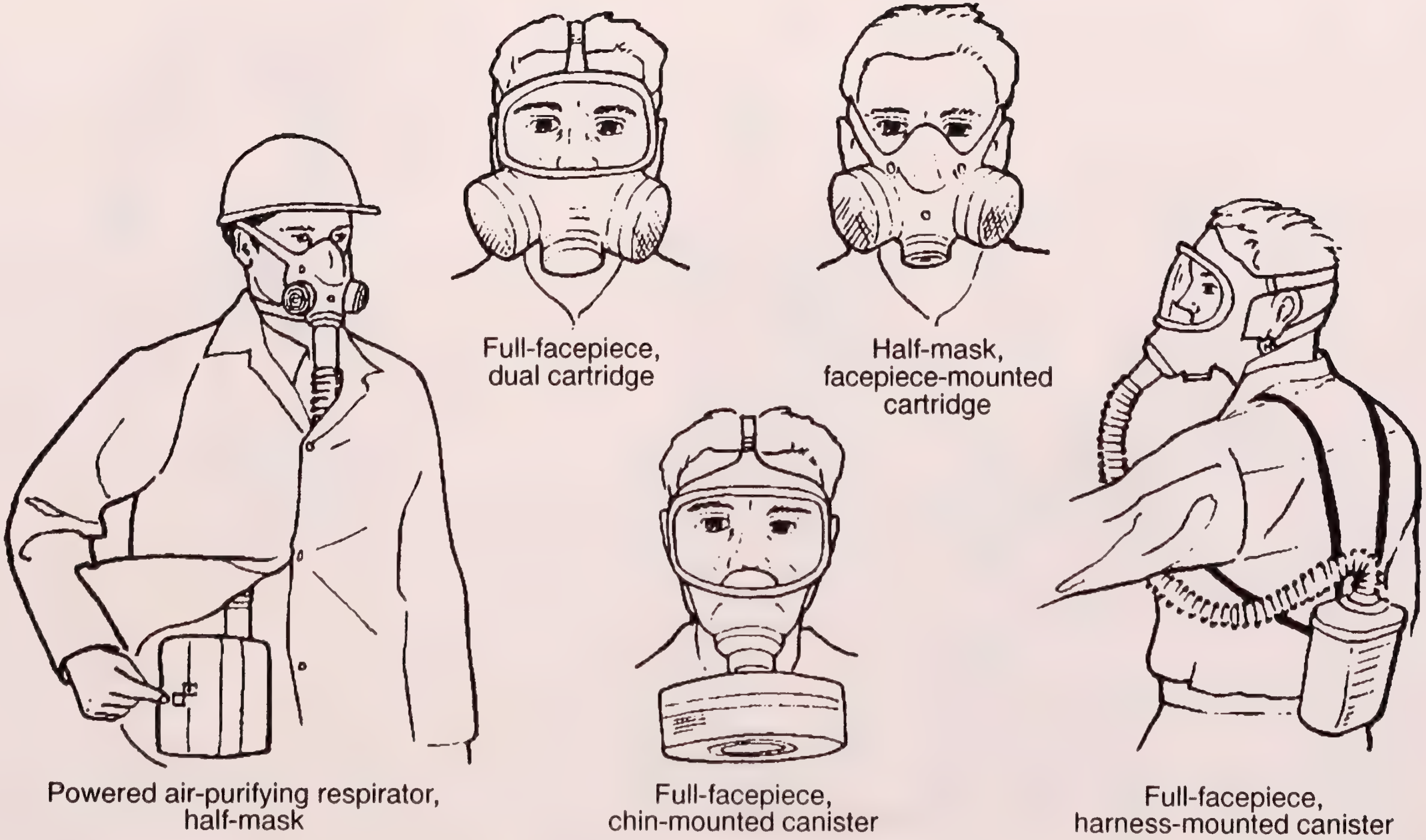
Supplied-air respirator, full facepiece

Source: NIOSH/OSHA/USCG/EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, 1985*

Example of Level B Protection

ATTACHMENT 4

TYPES OF AIR-PURIFYING RESPIRATORS FOR LEVEL C PROTECTION



Full-facepiece, dual cartridge

Half-mask, facepiece-mounted cartridge

Powered air-purifying respirator, half-mask

Full-facepiece, chin-mounted canister

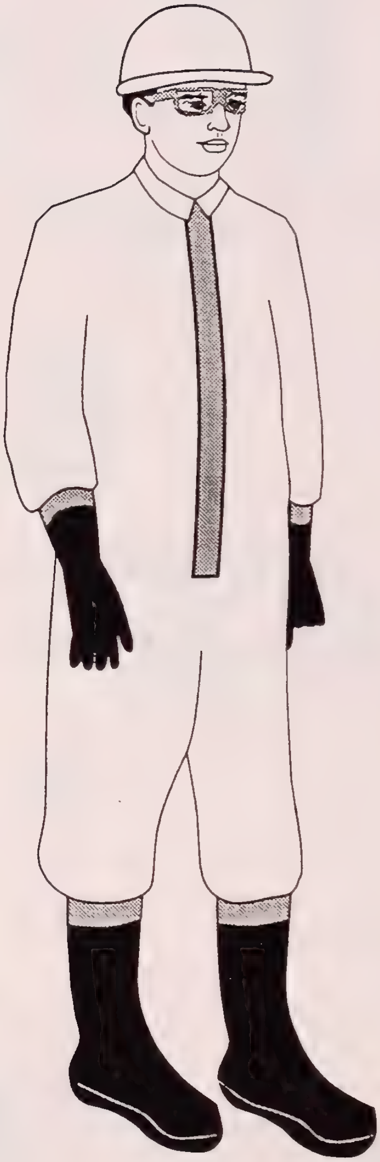
Full-facepiece, harness-mounted canister

Source: NIOSH/OSHA/USCG/EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, 1985*

Types of Air-purifying Respirators for Level C Protection

ATTACHMENT 5

EXAMPLE OF LEVEL MODIFIED D PROTECTION



Example of Level Modified D Protection

OGDEN ENVIRONMENTAL AND ENERGY SERVICES

STANDARD OPERATING PROCEDURE

S.O.P. NO. S-2
PAGE 1 OF 10
EFFECTIVE DATE 10/1/96
REVISION NO. 0
APPROVAL Dennis L. Waggett, CIH

TITLE

CONTROL OF HAZARDOUS ENERGY SOURCES (LOCKOUT/TAGOUT)

1.0 PURPOSE

This procedure establishes the minimum requirements for the protection of employees working on systems, machines, or equipment, where the unexpected energization, start-up, or release of stored energy could cause injury. It shall be used to ensure that the system, machine, or equipment is isolated from all potentially hazardous energy sources and locked and/or tagged out prior to employees beginning work in the affected areas. This procedure also applies to work performed at or near deenergized electrical equipment and circuits.

2.0 SCOPE

This procedure applies to all OEES personnel, personnel subcontracted to OEES, and visitors (including clients) who may work on or visit OEES job sites where personnel work on or near systems, machines, or equipment. It is to be used in conjunction with any existing facility procedures where work is to be performed.

3.0 DEFINITIONS

Affected Employee - Employees whose jobs require them to operate or use systems, machinery, or equipment that is being serviced or maintained or whose jobs require them to work in areas where service or maintenance is being performed.

Authorized Employee - A person who locks out and/or tags out systems, machinery, or equipment in order to perform service or maintenance on that system, machine, or equipment and has been properly trained in the control of hazardous energy sources.

Energy Isolating Device - A device that physically prevents the transmission or release of energy.

Energy Source - Any source of electrical, pneumatic, chemical, thermal, or other energy.

Lockout - The placement of a lockout device on an energy isolating device, ensuring that the equipment being controlled cannot be operated until the lockout device is removed.

Lockout Device - A device that utilizes a positive means (e.g. lock, either key or combination type) to hold an energy isolating device in a safe position and prevent the energizing of a machine or equipment.

Tagout - The placement of a tagout device to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

Tagout Device - A prominent warning device capable of being securely attached to an energy isolating device that identifies the applier or authority who has control of the energy control procedure, and contains information, instructions, or both to prevent the operation of an energy isolating device.

Primary Control - The Field Manager/Construction Supervisor (FM/CS) lock or tag (the first lock/tag to be applied and the last lock/tag to be removed from all isolation points).

Qualified Person (Qualified Employee) - A person who can demonstrate by experience or training the ability to recognize potentially hazardous energy and its potential impact on workplace conditions and has the knowledge to implement adequate methods and means for control and isolation of such energy; a qualified person shall also be trained and certified competent in:

- the skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment

- the skills and techniques necessary to determine the nominal voltage of exposed live parts

- the minimum approach distances specified in 1910.269, *Electrical Power Generation, Transmission, and Distribution*, corresponding to the voltages to which the qualified employee will be exposed

- the proper use of special precautionary techniques, personal protective equipment (PPE), insulating and shielding materials, and insulated tools for working on or near exposed energized parts of electric equipment

4.0 RESPONSIBILITIES

4.1 FIELD MANAGER/CONSTRUCTION SUPERVISOR (FM/CS)

The FM/CS is responsible for:

- ensuring all authorized employees are trained in accordance with OSHA 29 CFR 1910.147, *The Control of Hazardous Energy (Lockout/Tagout)*, and Section 5.0 of this procedure

- identifying all work activities requiring the isolation and lockout/tagout of hazardous energy sources

- coordination with the facility point of contact to ensure notification of all affected employees

- issuing the locks and tags to authorized employees and documented on the Lockout/Tagout Log (Attachment 1)

4.2 HEALTH AND SAFETY MANAGER (HSM)

The HSM is responsible for conducting a periodic inspection at least annually to ensure that the procedure and the requirements of OSHA 29 CFR 1910.147, *The Control of Hazardous Energy (Lockout/Tagout)*, are being followed.

4.3 SITE HEALTH AND SAFETY COORDINATOR (SHSC)

The SHSC is responsible for implementing and enforcing this procedure, as directed by the HSM during project operations and activities. The SHSC is also responsible for documenting implemented procedures. Copies of Lockout/Tagout Logs will be maintained on file by the SHSC.

5.0 PROCEDURE

5.1 CONTROL DEVICES

The authorized employee will obtain a lock and tag from the FM/CS. This issuance will be documented by the FM/CS by making an entry on the Lockout/Tagout Log, Attachment 1.

A lock and tag shall be placed on each energy-isolating device used to deenergize an energy source (e.g., circuit and equipment), except as provided in 5.1.3 and/or 5.1.4 below.

5.1.1 Locks

All locks used for lockout devices shall be substantial enough to prevent removal without the use of excessive force and shall be red in color. Red locks shall not be used for any other purpose. All locks used for lockout shall be identified with the authorized employee's name.

5.1.2 Tags

Tags shall be constructed and printed so that exposure to weather conditions will not cause the tag to deteriorate or the message to become illegible. All tags shall have a standard message as illustrated in Attachment 2. The tag attachment means shall be non-reusable, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of not less than 50 pounds. Tag attachments shall be at least equivalent to a one-piece, all-environmental tolerant nylon cable tie.

5.1.3 Locks without Tags

A lock may be placed without a tag only under all of the following conditions:

- only one circuit or piece of equipment is deenergized
- the lockout period does not extend beyond the work shift
- employees exposed to the hazards associated with reenergizing the circuit or equipment are familiar with this procedure

5.1.4 Tags without Locks

If a tag is used on an energy-isolating device that is capable of being locked out, the tag-out device will be placed where the lock would have been attached, or as close as possible, with at least one additional safety measure employed which provides a level of safety equivalent to that obtained by the use of a lock. Examples of additional safety measures include:

- removal of an isolating circuit element
- blocking of a controlling switch
- opening of an extra disconnecting device
- removal of a valve handle to reduce the likelihood of inadvertent energization

In instances where tags are used without a lock, the tag must be thought of as an equivalent to a lock and not be removed unless the authorized employee removes his/her tag in accordance with Section 5.2.7 (employee's tag) or Section 5.2.8 (another employee's tag).

5.2 LOCKOUT-TAGOUT PROCEDURE

5.2.1 Preparation for Deactivation

Prior to the start of a project, the SHSC and the FM/CS (or designee) shall survey the work areas to identify activities which require the isolation of a system, machine, or equipment.

Prior to the deactivation of a system, machine, or equipment, the FM/CS shall notify the facility point-of-contact and all affected employees.

5.2.2 Deactivation of Equipment or Machines

The machine or equipment shall be turned off or deactivated using the procedures established for the machine or equipment. An orderly deactivation must be utilized to avoid any additional or increased hazard(s) to employees as a result of the machine or equipment stoppage.

See also related SOP S-5, *Electrical Safety Requirements for Work at Transformers* for specific procedures regarding deactivation of transformers.

5.2.3 Isolation

All energy isolating devices that are needed to control the energy to the machine or equipment shall be physically located and operated so as to effectively isolate the machine or equipment from the energy source(s).

5.2.4 Application of Locks and Tags

Upon deactivation, the FM/CS shall place a lock on all isolation points capable of being locked. Lockout devices shall hold the energy isolating device in a "safe" or "off" position. All isolation points which are not capable of being locked shall be tagged (see Section 5.1.4).

The FM/CS lock or tag shall be considered the primary control. The primary control shall be the first lock/tag applied and the last removed.

When multiple isolation points are involved, a central lock box may be utilized. When used, the FM/CS shall place the keys of all primary control locks into the lock box and then lock the box. Each authorized employee will then apply their lock to the lock box, thus controlling all isolation points.

When necessary, an adapter or multi-locking device may be used to attach one or more locks to a single control mechanism.

5.2.5 Stored Energy (Electric and Non-electric)

Following the application of lockout/tagout devices to energy isolating devices, all potentially hazardous, stored, or residual energy shall be relieved, disconnected, restrained, or otherwise rendered safe by a qualified person.

5.2.6 Verification of Isolation

A qualified person shall use test equipment to test the circuit elements and electrical parts of equipment and shall verify that the circuit elements and equipment parts are deenergized. The test shall also determine if any energized condition exists as a result of inadvertently induced voltage or unrelated voltage backfeed. If the circuit to be tested is over 600 volts nominal, the test equipment shall be checked for proper operation immediately before and after this test.

Prior to starting work, each authorized employee shall verify that isolation and deenergization of the system, machine, or equipment has been accomplished.

See also related SOP S-5, *Electrical Safety Requirements for Work at Transformers*, for specific information on applying protective grounds (as part of a transformer deenergizing program).

5.2.7 Removal of Isolation and Reactivation

A qualified person shall conduct tests and visual inspections to verify that all tools, electrical jumpers, shorts, grounds, and other such devices have been removed so that the circuits and equipment can be safely energized.

Before removal of the primary controls the following shall be checked:

- all necessary guards have been replaced
- the affected area has been cleaned and all tools removed
- all affected personnel have been notified to "stay clear" of circuits and equipment

After these items are complete the FM/CS shall make a visual determination that affected employees are cleared and then remove all primary controls. The system, machine, or equipment may now be reactivated.

When work is complete, each authorized employee shall remove only his or her own lock or tag.

5.2.8 Removal of Another Employee's Lock (or Tag without a Lock)

Authorized employees should be instructed to remove their locks (or tag without a lock) after completing their portion of the work or when leaving the affected area for extended periods of time.

When it becomes necessary to remove the lock (or tag without a lock) of an employee who is absent from the job site, the following shall be followed:

1. The employee's supervisor shall verify that indeed the lock (or tag without a lock) owner is absent from the site.
2. All reasonable attempts shall be made to notify the employee.
3. The FM/CS may now direct the removal of the lock (or tag without a lock).
4. The employee's supervisor shall be responsible for making immediate notification to the employee upon return to the site.
5. All actions shall be documented by the FM/CS in the project log book.

5.3 TRAINING

In accordance with Volume IV, Training Program, of this manual, each authorized employee shall receive training in this procedure, the recognition of hazardous energy sources, the type and magnitude of the energy in the workplace, and the methods and means necessary for energy isolation and control.

When isolation points cannot be locked and tags are used, employees shall also be trained in the following, as listed in OSHA 29 CFR 1910.147, *The Control of Hazardous Energy (Lockout/Tagout)*:

- Tags are essentially warning devices affixed to energy isolating devices, and do not provide the physical restraint on those devices that is provided by a lock.

- When a tag is attached to an energy isolating means, it is not to be removed without authorization of the authorized person responsible for it, and it is never to be bypassed, ignored, or otherwise defeated.

- Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area, in order to be effective.

- Tags and their means of attachment must be made of materials which will withstand the environmental conditions encountered in the workplace.

- Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.

- Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.

Retraining shall be provided for employees whenever there is a change in the job assignments or when there is a change in the energy control procedure.

6.0 RECORDS

Lockout/Tagout Logs (Attachment 1) will be maintained by the SHSC. Records of training and annual program inspections will be maintained in the project files.

7.0 REFERENCES

Fed-OSHA. 1995. 29 CFR 1910.147, *The Control of Hazardous Energy (Lockout/ Tagout).*

Fed-OSHA. 1995. 29 CFR 1910.269, *Electric Power Generation, Transmission, and Distribution.*

Fed-OSHA. 1995. 29 CFR 1910.333, *Selection and Use of Work Practices.*

DOE/ID-1044 "Construction Safety Reference Guide."

U.S. Army Corps of Engineers. 1992. *Safety and Health Requirements Manual*, EM 385-1-1.

8.0 ATTACHMENTS

1. Lockout/Tagout Log
2. "Danger - Do Not Operate" Tag

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ATTACHMENT 1

LOCKOUT/TAGOUT LOG

LOCKOUT / TAGOUT LOG

PROJECT/FACILITY ______________________ SHSC ______________________

LOCK NO.	ISSUED TO:	ISSUED BY:	DATE/ TIME ISSUED	EQUIPMENT DESCRIPTION AND LOCATION FOR USE	NAME OF EMPLOYEE WHO RETURNED LOCK	DATE EMPLOYEE RETURNED LOCK:	COMMENTS

OGDEN

ATTACHMENT 2

"DANGER - DO NOT OPERATE" TAG

DANGER

DO NOT
OPERATE

PERSONNEL
PROTECTION

Lockout/Tagout

DANGER

Tag No.:

Device Position:

Applied By

Name:

Company:

Date:

OGDEN ENVIRONMENTAL AND ENERGY SERVICES

STANDARD OPERATING PROCEDURE

S.O.P. NO. S-4
PAGE 1 OF 22
EFFECTIVE DATE 10/1/96
REVISION NO. 0
APPROVAL Denise L. Doggett, CIH

TITLE DRILLING SAFETY

1.0 PURPOSE

The purpose of this health and safety SOP is to provide OEES personnel with procedures for general drilling safety, including aspects at sites which have been characterized as hazardous or potentially hazardous.

2.0 SCOPE

This procedure applies to all members of OEES field teams, including subcontractors, involved in drilling and associated activities.

3.0 RESPONSIBILITIES

3.1 HEALTH AND SAFETY MANAGER (HSM)

The HSM, or regional designee, is responsible for implementation of this procedure.

3.2 SITE HEALTH AND SAFETY COORDINATOR (SHSC)

The SHSC serves as the primary coordinator for all activities associated with drilling operations at field sites. The SHSC shall receive the inspection reports for drilling equipment used onsite from the subcontractor.

3.3 FIELD MANAGER (FM)

The Field Manager (FM) or designee who works in or around drilling operations is responsible and accountable for adhering to and enforcing this procedure.

The FM is responsible for:

- ensuring that all employees assigned to drilling activities are instructed in the types of hazards associated with drilling operations
- ensuring adherence to safe work practices and techniques
- directing a pre-work safety meeting
- ensuring that personnel leave the drilling site if a potentially hazardous condition is recognized

3.4 FIELD PERSONNEL

All field personnel involved in drilling at all locations shall be familiar with this procedure and work within the guidelines provided.

3.5 SUBCONTRACTORS

All subcontractors involved in drilling shall be familiar with this procedure and work within the guidelines provided. The subcontractor supervisor (or designee) is also responsible for performing and documenting equipment safety inspections.

4.0 PROCEDURE

The following guidelines shall be implemented during general drilling operations.

4.1 HAZARDS ENCOUNTERED PRIOR TO OR DURING DRILLING

4.1.1 Fire and Explosion

To lower the potential for fires or explosions at drill sites:

- Flammable liquids shall not be stored or left within 50 feet of drill rigs, pumps, grout plants, or other related machinery (includes empty/full cans).

- Excess flammables will be stored in UL-approved safety cans or Department of Transportation (DOT)-approved drums with the appropriate dispensing device in a secure area onsite.

- Smoking, open flames, or spark-producing equipment, including lighters, matches, etc., are not permitted within 50 feet of drill rigs, open wells, gasoline-driven pumps, or fuel storage areas. Open flames greater than 25 feet from such areas are only permitted with the issuance of a Hot Work Permit in accordance with SOP S-8, *Hot Work Permits*.

- A 20-pound ABC fire extinguisher shall be located within the Exclusion Zone, not less than 10 feet but not greater than 25 feet from any operating drill rig. Fire extinguishers should be periodically inspected by the SHSC and maintained in operating condition at all times. Records shall be kept showing the date when the equipment was last inspected, tested, or refilled.

- When refueling equipment, a fire extinguisher shall be located no less than 10 feet from the equipment. Equipment engines shall be shut off during fueling.

- Grounded fuel containers will be used. If using dispensing fuel containers, all containers must be UL-approved and equipped with flame arrestors. These fuel cans shall be returned to a designated safe storage area after fueling is completed.

- Drums containing Class 1 liquids must be stored in a vertical position and must be equipped with a dispensing pump. These liquids (e.g., gasoline) shall not be dispensed by gravity from tanks or drums. Drums and pumps shall be electrically grounded and a bond installed to metal containers being filled with Class 1 liquids. UL-approved, self-closing flammable cans must be used for the storage of Class 1 liquids that are in immediate use. When not in use, flammable cans should be stored in a UL-approved flammable cabinet.

- Class 2 liquids (e.g., diesel fuel) may be stored in a vertical or horizontal position, and may be dispensed by gravity from tanks and drums, provided they are equipped with a UL-listed, self-closing valve. Class 2 liquids must also be contained within a UL-approved flammable can and, when not in use, stored in a flammable cabinet. These liquids may be dispensed by gravity from tanks and drums provided they are equipped with self-closing valves.

- Class 3 liquids may not be dispensed by gravity from tanks and drums inside a building without local fire department approval. All combustible liquid storage must be in compliance with local code and ordinance requirements.

- The mouths of all metallic containers of 5 gallons or less must be kept in metallic contact during the transfer of flammable liquids.

- Extreme caution shall be used during drilling in areas where explosive gases/vapors are suspected. If 10% (or higher) lower explosive limit (LEL) explosive gases are detected in the hole being drilled (see Section 4.3.6) cease operations and contact the HSM. Be sure all ignition sources are extinguished.

- All ignition sources, such as drill rig engines, compressors, and generators, shall be placed upwind or crosswind of drill holes that could potentially contain explosive gases greater than 10% LEL.

- If fire extinguishers are used to fight a fire, the extinguisher shall be temporarily replaced and refilled or permanently replaced immediately after use.

4.1.2 Hazardous Noise

During drilling operations the allowable noise level of 85 dBA is routinely exceeded. In consideration of this:

- All workers shall wear hearing protection whenever they are working in a high noise area.

- Ear protection shall be worn if measurements have not been made and there is not an accurate way to measure the sound level to determine if ear protection is needed or if workers have to shout to communicate when they are three feet apart or less.

- Ear plugs shall be worn by all personnel within 25 feet of split-spoon driving and removal when grout/cement mixing equipment are in operation and at any other locations where there is the potential to be exposed to hazardous noise.

Refer to SOP H-10, *Hearing Conservation Program*, for additional information.

4.1.3 Ergonomics

Mobilization and demobilization require air monitoring equipment, sampling equipment, and related items to be moved. Personnel should always test an object to obtain a rough estimate of its weight prior to actually lifting. If the object will cause the worker to strain upon lifting, then two or more workers (as many as necessary) shall lift the object. Lifting should always be performed in such a way that the lifter brings the load as close to the body as possible. When necessary, site workers shall make two trips to carry several objects, rather than straining to carry many objects in one trip.

Waste drums can be extremely heavy and difficult to move. It is typically necessary to transfer the drums from the location where sampling took place to the drum storage area. When transferring drums, personnel shall use a drum dolly, forklift (with a trained operator), or other appropriate means. Personnel shall not roll waste drums from one location to another, nor shall drums be dragged as a means of moving them.

Several parts of the sample equipment decontamination procedure pose ergonomic hazards. Decontamination of sample equipment involves vigorous manual scrubbing with brushes, stooping over and reaching into decontamination buckets, repeated use of spray bottles, and lifting of buckets to transfer the contents to remotely located waste drums. Site workers can easily develop wrist, hand, finger, arm, neck, and back pain from repetitively or carelessly performing the above procedures or from working in an inappropriate work posture. Decontamination shall be performed with steady motions. Decontamination buckets shall be elevated to prevent back strain. Hand and finger pain can be prevented with the use of hand-powered pumped spray devices rather than triggered spray bottles. Drums can be transported by a drum dolly to the location of the decon buckets, or lids can be placed on the buckets and the buckets moved by an appropriate method (not in clean vehicles). Rotation of personnel on job tasks will help prevent the potentially hazardous effects of decontamination tasks.

To lower the potential for injuries during material handling:

- Extreme caution shall be used when lifting or moving heavy materials.
- All personnel shall have a thorough knowledge of proper lifting techniques which must be employed when necessary.
- Two or more persons shall lift or move materials weighing 50 pounds or more. Such materials would include 10-inch or larger augers, pumps, full 55-gallon drums, and bulky objects. Mechanical means such as forklifts, lift gates on trucks, or mechanical driven cable systems shall be used whenever practical.

4.1.4 Rotating Machinery

Before performing work on rotating machinery or on automatic equipment, verify the position of all electrical control or starting devices. When inspections or repairs are to be made, all remote-controlled or automatic start parts must be controlled by locking out the circuit breakers or switches and pulling the fuses. Refer to the SOP S-2, *Control of Hazardous Energy Sources*.

Machinery that is connected to blowers, water wheels, or pumps without check valves may turn even when the current to the motor has been disconnected. The rotor or armature must be blocked to achieve a state of zero energy.

When rotating or automatic machinery is in operation, workers will not remove or adjust motor brushes, contacts, commentators, or slip or collector rings.

To avoid entanglement during operation, employees will not wear loose clothing or loose gloves, wrist watches, rings, or metal pendants around rotating or automatic equipment.

4.1.5 Heat Stress

Detailed information regarding heat stress hazards is provided in SOP H-9, *Heat Stress Control*, in this manual.

4.2 SPECIFIC OPERATIONS

4.2.1 Clearing the Work Area

Prior to drill rig setup, adequate site clearing and leveling should be performed to accommodate the drill rig and supplies and provide a safe working area. Drilling shall not commence when tree limbs, unstable ground, or site obstructions cause unsafe equipment handling conditions.

The following items serve as a guide to drilling operations safety measures but should not be considered inclusive:

- Clear work area of obstructions and debris prior to rig setup.
- Level and stabilize the rig prior to raising the mast.
- Grade the site if the working platform is unstable.

Underground and overhead utilities must be identified by:

- mechanical and visual inspection of the site
- review of available site plans for the area
- information supplied by utility company personnel

Precautions and preplanning will be used to avoid intrusion or impact during site activities. Where necessary, utilities will be deactivated prior to site activity. If subsurface work is being performed in areas with fill material, digging will be initiated manually, using a shovel, to avoid contacting utility lines. In order to avoid contacting underground utilities, a minimum distance of 5 feet will be maintained between all equipment and detected underground lines. In order to avoid contacting or arcing with overhead utility lines, a safe distance of 20 feet will be maintained between all equipment and overhead lines, in accordance with OEES policy.

Alternatives to safe distances include deenergizing the overhead utility line and visibly grounding it at the point of work, or placing insulating barriers that are not a part of or attached to the equipment over the live lines to prevent physical contact with the line. Workers are prohibited from moving drill rigs with masts deviating from the horizontal position. Masts must always be lowered before moving drill rigs. OEES Safe Work Practices, Section 6.8, and Universal Hazards and Controls, Section 5, of Volume II, Comprehensive Field Project Health and Safety Program, of this manual, and SOP S-2, *Control of Hazardous Energy Sources*, of this manual, provide additional information about electrical safety.

4.2.2 Start-Up

Hollow-stem auger rig components are shown on Attachment 1. Direct rotary rig components are shown on Attachment 2.

After the subcontractor supervisor completes the drill rig inspection and documentation (Attachment 3, Daily Drill Rig Checklist), the following shall apply:

- Ensure that all gear boxes, hoist levels, and hydraulic levers are in the neutral position.
- Ensure that the cathead rope or catline is not on the cathead before starting the engine.
- All site personnel should be instructed to "stand clear" of the drill rig immediately prior to and during start-up of an engine.
- The subcontractor shall place a sheet of polyethylene completely under the rear end of the drill rig to catch any contamination resulting from drilling activities and protect the surrounding area. The plastic shall be used only once per borehole and shall be placed into 55-gallon, DOT-approved drums for disposal after use.
- Drill rig platforms and stairs along with the immediate work area must be kept clear; do not allow oil, grease, and/or excessive mud to accumulate in these areas.
- The discharge of drill rig fluids and foam must be channeled away from the work area to prevent ponding or slippery conditions. In addition, drilling fluids and foam residues must be properly disposed of in 55-gallon, DOT-approved drums.

4.2.3 Safe Operation of Drill Rigs and General Site Conditions

The following is an overview of safe drill rig work practices for reference only. The drill rig operator is expected to have superior knowledge of the safe operation of the rig and its appurtenances.

- The driller-in-charge shall assure that only qualified drillers operate the rig.

- The drill and augers shall be handled and operated in a safe manner.

- If cable repairs on the mast are required, the mast shall be lowered.

- For cases where the mast cannot be lowered: Unless ascending or descending a mast or derrick by means of a ladder fitted with approved OSHA cage guards, no person should attempt to ascend or descend unless wearing an approved full-body harness with shock absorbing capabilities. The harness shall be correctly fitted, adjusted, and attached to a mobile safety climbing device (rope or cable). Workers shall be instructed in the correct procedures by a skilled person. Refer to SOP S-7, *Fall Protection and Prevention*, for procedural information.

- A full-body harness and lifeline shall be provided and its use required for each employee who works 6 feet or more above the floor or main work deck.

- Only personnel who are qualified and trained in drilling (i.e., drillers and their helpers) shall handle equipment associated with drilling operations. Included are augers, drive rods, ropes, cables, etc.

- Maintain proper clearance (at least 20 feet) from overhead hazards such as power lines.

- Under no circumstances shall the drill rig be moved with the mast raised, no matter how small the distance.

- Onsite hazards shall be kept to a minimum. Items such as hand tools, rakes, shovels, etc. shall not be left lying on the ground (tripping hazards).

- All brush over four feet high in the vicinity of the drilling operations shall be cut.

- Site entry/exit pathways, as well as work areas in the Exclusion Zone and decontamination area, shall be defined and kept clear of all items and debris.

- Items such as pallets shall be used as platforms or walkways to provide better footing in wet and muddy work areas.

- During site activities, the minimum drilling crew to be employed will consist of one trained, experienced driller and one helper.

- The drilling crew and SHSC will be aware of the location and proper operation of the rig's emergency shutdown equipment (kill-switches, etc.) and procedures.

- Watch for slippery ground when mounting/dismounting the drill platform.

- All persons in the vicinity of the drill rig must wear safety glasses with side shields at all times.

- The brakes shall be set and/or wheels blocked when the rig is set up at a site.

- A drill rig should only be operated from the position of the controls.

- Clean mud and grease from boots before mounting a drill platform.

- Never leave the drill rig while it is operating.

- OEES personnel (geologists, engineers, etc.) will not assist the drill crew with their work while the drill rig is operating.

- Subcontractors shall ensure, however, that OEES personnel know how to turn off drilling equipment in case of an emergency.

- Extreme care will be used during placement or removal of augers and casings and during start-up of rotating drilling equipment (such as hollow-stem augers, rotary tables, and catheads).

- Dust suppression techniques will be employed to the greatest extent possible to minimize the generation of dust/particulates and associated contaminants into the atmosphere. A water tap should be fitted with a nozzle or other device to create a water spray or curtain to contain dusts.

- No petroleum-based grease or oil shall be used on auger pipe joints; however, Teflon grease or vegetable oil is acceptable.

- Drill rods or core barrels should never be left unsecured, balanced across, or leaning on the rig.

- Operators should keep all body parts away from rotating augers.

- When moving a rig off-road, be aware of any obstacles in the route of travel. It is recommended to walk the route first. Walk around the rig before demobilization to check for obstacles.

- Have an assistant guide the driver when in proximity to hazards or if clearance is at a minimum.

- Do not move drill rigs up or down steep slopes without the assistance of a dozer tagging it off.

- Heavy equipment cannot stop quickly on wet ground; therefore, allowances should be made to ensure a safe stopping distance.

- All unattended boreholes must be adequately covered.

4.2.4 Derricks/Masts

A derrick or mast is the tower component of a drilling or well-servicing rig that supports the crown block assembly (over which hoisting lines are reeled), the traveling block (travels between the derrick or mast floor and crown block), and hoisting lines. The term "monkey board" is often used to describe the derrickman's working platform.

Procedures for working on or near derricks/masts are as follows:

- Before raising the mast, look for overhead obstructions.
- Before raising the mast, make sure the drill rig is level and stabilized.
- Lock the mast in place before drilling.
- All loose tools and materials shall be removed or secured, and no worker shall be allowed under the derrick while it is being lowered or raised.
- All derricks and portable masts should be equipped with approved fixed ladders to provide access to all working areas from the floor to the crown. Drill rig masts shall not be used as ladders.
- Rig personnel shall always face the ladder when ascending or descending.
- For cases where the mast cannot be lowered: Unless ascending or descending a mast or derrick by means of a ladder fitted with approved OSHA cage guards, no person should attempt to ascend or descend unless wearing an approved full-body harness with shock absorbing capabilities. The harness shall be correctly fitted, adjusted, and attached to a mobile safety climbing device (rope or cable). Workers shall be instructed in the correct procedures by a skilled person. Refer to SOP S-7, *Fall Protection and Prevention*, for additional information.

4.2.5 Hollow Stem Auger Drilling

Hollow stem auger drilling is particularly useful in obtaining accurate samples. Penetration rates are relatively slow compared to those of rotary drilling (discussed in Section 4.2.6). An example of the typical drill rig used for hollow stem auger drilling is provided on Attachment 1.

- Handle augers with care. Serious injury or death can result from being caught or pinched in rotating equipment or from improper lifting of augers.

- Be aware of the rig's emergency shut-down equipment (Kill-switch) and procedures

- Use proper lifting techniques; use a tool hoist, if possible.

- Stay clear of rotating augers and pinch points, such as cables and pulleys.

- Passage under, or stopping over, a moving stem or auger is prohibited.

- Drill crews are not allowed on the mast while the drill bit/auger is in operation or during transport.

- Long-handle shovels will be used to remove cuttings from around the auger.

- Loose clothing, hair, or jewelry are not permitted near rotating augers.

- Placing hands or shovels on augers while they are rotating is forbidden; burrs and or damaged augers can grab and pull tools or people into the rotating augers.

4.2.6 Rotary Drilling

Rotary drill rigs operate with either an air-based or water-based drilling fluid. The borehole is drilled by rotating a bit. In the air rotary method, air alone lifts the cuttings from the borehole. A large compressor provides air that is piped to the swivel hose. The air, forced down the drill pipe, escapes through small ports at the bottom of the drill bit. The cuttings are blown out the top of the hole and collect at the surface around the borehole. Injecting a small volume of water or surfactant and water (foam) into the air system controls dust and lowers the temperature of the air. Cuttings are removed by continuous circulation of the fluid. For safety reasons, a dust deflector shall be used during open-hole air or mud settings. A divertor and cyclone shall be used for casing advancement or reverse circulation situations. A diagram of a direct rotary drill rig is provided on Attachment 2.

- The ends of connecting hose sections shall be secured together by means of clamps and a safety chain or wire rope. The clamps shall be tightly fitted to and near the ends of the connecting hose sections and the chain or wire rope securely fastened to each of the clamps.

- The standpipe of the rotary drilling rig is a vertical pipe that joins the rotary hose to the circulation system. The standpipe end of the circulating hose shall be secured to the standpipe, derrick, or mast, and the other end to the circulating pump by a clamp and chain and wire rope. Clamps shall be tightly fitted to and near the end of the hose and the chain or wire rope attached to it; to the standpipe, derrick, or mast; and to the mud pump skid.

4.2.7 Split-spoon Sampling

Split-spoon soil sampling requires that an impact hammer connected to a wire pull rope, which is wound around a "cathead" pulley, be used to drive the split-spoon sampler into the hole to collect soil samples at various depths. The pull rope is manually pulled and released to lift and drop the hammer, driving the sampler into the soil. The following precautions shall be adhered to during split-spoon sampling:

- Workers who operate the driving hammer shall be thoroughly trained in the proper use of the impact hammer. Only drillers who are thoroughly trained and experienced shall operate the pull rope to drive down and pull up the sampling device.

- No one shall bend down or stand directly below the hammer while sample driving or removing is in progress.

- If the sample rod must be kept straight and steady, a mechanical holding device with quick-release capability shall be attached to the drilling rig to support the sampling rod and guide the hammer.

- Before each use, the wire pull rope shall be inspected for wear; the cable securing the rope to the hammer will be checked to verify that it is securely fastened (see Wire Rope Wear and Damage illustrations, Attachment 4).

- Wire pull ropes shall be replaced if the inspection reveals signs of severe wear such as fraying, etc. Refer to Section 4.3.4 for inspection information.

- Before each use, the driller, along with his helper, shall inspect the sample rods for cracks and other signs of severe wear.

- Rods shall be replaced and shall not be used if they are found to be cracked or otherwise damaged.

- The hammer shall be inspected before each use. Particular attention shall be given to welded areas (i.e., the handle used to attach the pull rope).

- Hearing protection is mandatory while driving split spoons.

4.2.8 Catheads, Rope Hoists, and Saf-T-Drivers

A cathead is a spool-shaped metal, mechanical device mounted on the end of a shaft on which the rope is wrapped. The rotating cathead imparts a pulling power to the rope that is wrapped on it. Catheads are extremely dangerous. Damaged catheads should be replaced so worker safety is not further jeopardized. For safety reasons, a Saf-T-Driver hoist is typically used to replace a cathead.

- If a cathead is mounted on the end of a shaft that projects beyond the guard for other moving parts of machinery, the shaft end, key, or other device for securing the cathead to the shaft, should be covered with a smooth thimble. The thimble should be of such a design that a rope cannot wind around it.

- Catheads on which the catline is manually wound shall have a reasonably smooth surface, be equipped with a divider for separating the first wrap of the catline from subsequent wraps, and be free of projections on which an employee's clothing might be caught during operation of the catline.

- In the event of fouling, no attempt should be made to free the line while a cathead is in motion.

- While operating the cathead, the operator will be on a slip-free surface.

- The catline must be the right length, clean, preferably dry, and sound.

- Not more than one wrap should be put on a cathead until all slack has been taken up and initial tension has been applied.

- While the rope is wrapped on the drum, the cathead must always be attended.

- The catline must never be wrapped around any part of your body.

- Use an adequate amount of wraps on the cathead to hoist the load.

- The cathead barrel must be kept free of rust, grease, and rope grooves.

- Loose clothing or loose gloves may not be worn while operating the cathead.

- An adequate amount of clearance must be maintained between other hoist lines to prevent contact with the catline.

- An adequate amount of clearance must be maintained between personnel and the impact hammer.

- Personnel must keep at least 18 inches away from the cathead drum at all times while it is in operation.

- The Saf-T-Driver hoist line must be kept free of slack and kinks. Daily inspection of wires for fraying must be maintained.

4.2.9 Safe Operation of Drill Rigs in Landfills

Landfill drilling presents a fire/explosion hazard. Pockets of methane or other flammable/explosive materials may be encountered. Because of this, there is the potential for surface or downhole fires or explosions. To control the hazard:

- The drill rig should be diesel powered and equipped with a spark-arresting muffler.

- Explosive gases should be monitored as continuously as possible using an explosimeter and oxygen meter. The meter should be kept on the rig at all times during intrusive activities (see Section 4.3.6 of this SOP).

- LEL readings in and around the borehole shall be immediately evaluated with an organic vapor monitoring instrument. Direct-reading colorimetric tubes may be used to determine the presence of toxic gases. Refer to the site-specific Health and Safety Plan (HSP) for project action levels.

- The rig and all ignition sources shall be placed upwind or crosswind from the borehole.

- The borehole shall be saturated with water where feasible to reduce the risk of downhole explosions.

- If explosive gases exceed 10% LEL at a radius of 5 feet outside the borehole, drilling operations should cease; crews should be placed on standby until levels are reduced by natural wind ventilation. If the % LEL does not decrease to a safe level, then at least one of the following vapor suppression/dissipation techniques shall be implemented to reduce levels:

  - While the rig is operational, a high-capacity fan can be used to aid the wind in dissipating escaping vapors from the borehole. Fans will have explosion-proof wiring or be powered by a diesel-operated generator. Under no circumstances should air be directed into the borehole.

  - While the rig is operational, a fire-suppressant foam such as AFFF™ may be used to reduce the potential for sparking or flare-ups. However, this technique requires the use of containment dikes, and protective coveralls and gloves, and is not recommended for use under windy conditions. The Material Safety Data Sheet (MSDS) for this foam and all chemicals brought onsite must be kept onsite with the site-specific HSP.

  - While the rig is not operational, an inert gas (such as nitrogen or carbon dioxide) purging system should be used to displace methane gas. The inert gas should be introduced to the base of the borehole with 1/4-inch copper tubing, at a rate of approximately 40 pounds per square inch gauge (psig). Subsequent gas/vapor readings and the inerting gas regulator inspections shall be performed in Level B (supplied air) to ensure personnel safety.

4.3 ADMINISTRATIVE CONTROLS

4.3.1 Training

All personnel working on a hazardous waste site in the proximity of an operating drill rig and the support equipment shall be thoroughly familiar with the operational hazards involved and shall have completed the OSHA 29 CFR 1910.120 *Hazardous Waste Operations and Emergency Response* (HAZWOPER) training and annual updates, if applicable. Hearing conservation and personal protective equipment training shall be covered either as part of the HAZWOPER training, or in separate sessions. Support equipment includes grout plants, pumps, powered earth-moving equipment such as bulldozers, backhoes, etc.

For work taking place on non-hazardous waste sites, hearing conservation and respiratory protection training, as well as a thorough familiarity with the drill rig and support equipment, are required.

Subcontractors shall be responsible for ensuring that their employees receive proper training in HAZWOPER (as applicable), hearing conservation, and personal protective equipment to limit the potential for job-related injuries/illnesses.

Training requirements are also discussed in Volume IV, Training Program, of this manual.

All training shall be documented and a copy of the training certificates shall be placed in the employee personnel or health and safety records.

4.3.2 Medical Surveillance

Personnel who are required to work on hazardous waste sites or wear respiratory protection will have completed a baseline or repeat physical, and exit physical examination, as necessary, in accordance with OSHA 29 CFR 1910.120 *Hazardous Waste Operations and Emergency Response*, and/or 29 CFR 1910.134, *Respiratory Protection*. Documentation should be placed in employee personnel or health and safety records.

Due to the need for hearing protection to protect from high noise levels around drill rigs, workers will receive baseline and annual audiograms, as required by 29 CFR 1910.95, *Occupational Noise*, and SOP H-10, *Hearing Conservation Program*.

Subcontractors shall provide the necessary medical surveillance for employees working on OEES projects.

4.3.3 Personal Protective Equipment (PPE)

The following PPE shall be worn:

- At a minimum, hard hats, safety-toe work boots/shoes, safety glasses, and work gloves shall be worn by all workers.
- Ear protection devices such as ear plugs, ear muffs, or plugs and muff combinations shall be worn, as required.
- Chemical protective clothing, goggles, and an air purifying respirator fitted with a dust filter shall be worn by all personnel handling cement grout during grouting.
- Additional protective equipment requirements will be covered in the site-specific HSP.
- All protective equipment shall be provided by respective employer(s).
- Worn, damaged, or excessively soiled equipment shall be replaced as required.

Refer to SOP H-12, *Personal Protective Equipment*, for additional information.

4.3.4 Eating, Drinking, Chewing, or Smoking

To limit the potential for ingestion of contaminants:

- Eating, drinking, chewing, or smoking is not allowed on any drill rig or in any restricted zone.
- A break area shall be set up with hand and face washing provisions in the Support Zone.

- Before eating, drinking, or smoking, all personnel shall thoroughly wash their hands and face. Soap and water shall be supplied for this purpose.

- Alcoholic beverages and drugs of any type shall not be consumed at any time during the drilling day. In addition, any employee suspected of being under the influence of drugs or alcohol at any time during the work day will be removed from the site.

4.3.5 Equipment Safety Inspections

The subcontractor supervisor (or designee) will be responsible for ensuring the inspection of all machinery and equipment within 7 days prior to its use onsite and before daily use to make sure it is in safe operating condition. In most cases the competent individual inspecting will be the subcontractor, owner, or operator. The Machinery and Mechanized Equipment Certification form (provided as Attachment 5) shall be submitted to the OEES Purchasing Department upon completion. Drill rigs and related support equipment and vehicles shall be inspected by the driller-in-charge on a daily basis. Inspections will be made to determine that the brakes, lights, alarm systems, exhaust system, operating systems, drill rig controls, and any emergency shut-off controls are in proper working condition. All hydraulic lines and fittings shall be free from wear and damage, and cable systems and pull ropes shall be properly installed and free from fraying and other damage. For drill rigs, all inspections will be documented on the Daily Drill Rig Checklist (Attachment 3) or equivalent subcontractor forms. A written report of the results will be made and kept on file by the SHSC. The SHSC shall enforce the equipment inspections.

Verification of inspection deficiencies and corrective action shall be recorded daily in the field log book by the FM. Any machinery or equipment found to be unsafe by the subcontractor supervisor or SHSC will be taken out of service and its use prohibited until unsafe conditions have been corrected. Preventive maintenance shall be conducted for all equipment according to the subcontractor's internal policies, schedules, and equipment SOPs. Only preventive maintenance procedures recommended by the manufacturer will be followed.

Should the operator observe any equipment deficiencies at any time that affect safe operation, they will be corrected before continuing operation and will have approval from the SHSC.

All running ropes (wire ropes), shackles, and tow hooks that are in continuous service shall be visually inspected once each day for:

- distortion such as kinking, crushing, unstranding
- birdcaging, main-strand displacement, or core protrusion
- general corrosion
- broken or cut strands (must be covered or blunted)
- number and type of visible broken wires (in any length of 8 diameters, the number of visible broken wires must be less than 10% of the total number of wires)
- core failure in rotation-resistant ropes
- any other condition relative to the rope that may cause rope failure

Attachment 4 presents examples of common wire rope damage.

These practices serve as a basic guide and do not encompass all pertinent safety-related regulations. Subcontractors are responsible for full compliance with all applicable laws, ordinances, rules, and regulations of federal, state, and local authorities regarding project activities.

4.3.6 Operator Qualifications

Machinery and mechanized equipment will be operated only by qualified personnel, in accordance with the procedures set forth in OSHA 29 CFR 1910.178, P*owered Industrial Trucks* and 29 CFR 1926.20, *General Safety and Health Provisions*. All heavy equipment operators will demonstrate their proficiency on the equipment prior to actually beginning work onsite.

4.3.7 Air Monitoring

To lower the potential for employee and public overexposure and for fire and explosion, air monitoring shall be performed at regular intervals as specified in this procedure and in the site-specific HSP. Readings will be documented on forms provided in the site-specific HSP. In general:

- Explosivity shall be monitored at the rig as continuously as possible; a meter shall be placed on the rig as close to the borehole (source) as feasible.

- Toxics and explosivity shall be monitored at the site perimeter, in the breathing zone of workers and in the general work area at least once per hour, or as specified in the site-specific HSP. Monitoring will also be conducted with any change in site conditions or marked increases in previous readings, and/or at the discretion of the SHSC.

- Background monitoring will be conducted prior to the initiation of site activities each day, and upon mobilization of the drill rig to a new location.

5.0 RECORDS

The Machinery and Mechanized Equipment Certification form (Attachment 5) and Daily Drill Rig Checklist (Attachment 3) must be completed to comply with this procedure.

6.0 REFERENCES

Fed-OSHA. 1995. 29 CFR 1910, *General Industry Standards.*

Fed-OSHA. 1995. 29 CFR 1926, *Construction Industry Standards.*

Fed-OSHA. 1995. 29 CFR 1910.95, *Occupational Noise.*

Fed-OSHA. 1995. 29 CFR 1910.120, *Hazardous Waste Site Operations and Emergency Response.*

Fed-OSHA. 1995. 29 CFR 1926.152, *Flammable and Combustible Liquids.*

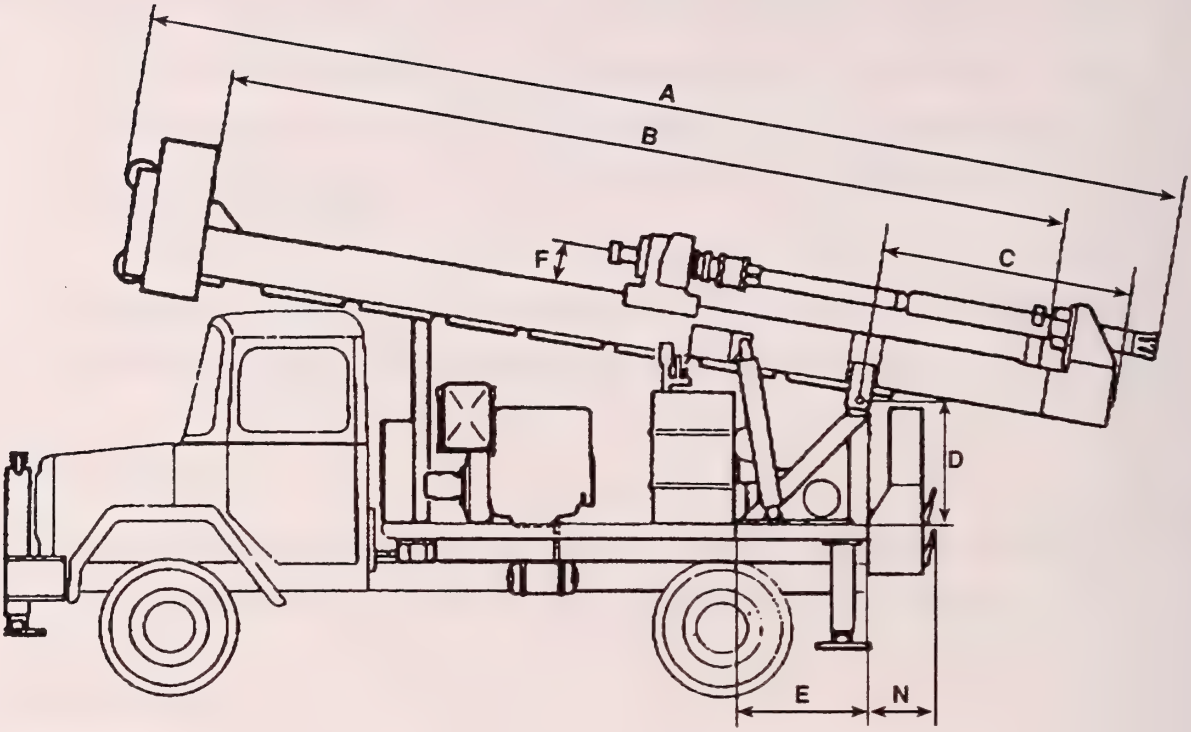
Valley Well Drilling. Technical Approach to Drilling, Sampling, Monitor Well Installation, and Well Development.

7.0 ATTACHMENTS

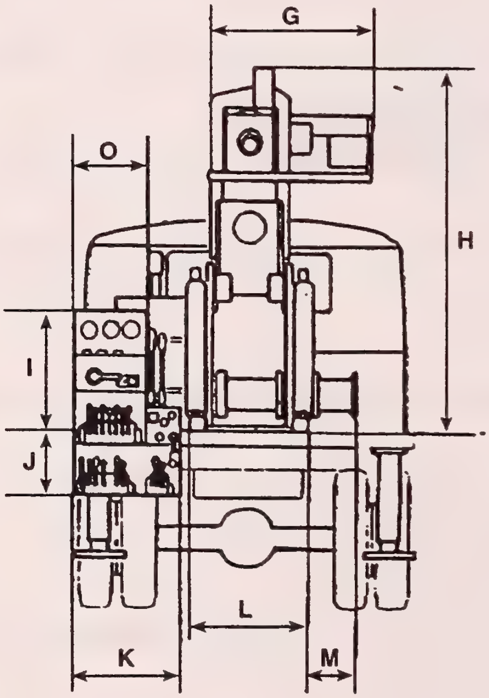
1. Hollow Stem Auger Drill Rig Operational Components
2. Direct Rotary Rig Operational Components
3. Daily Drill Rig Checklist
4. Wire Rope Wear and Damage
5. Machinery and Mechanized Equipment Certification Form

ATTACHMENT 1

HOLLOW STEM AUGER DRILL RIG OPERATIONAL COMPONENTS



Side View



Rear View

The following highlight possible hazard areas that envelop every drilling operation.

- **A.** Mast/Derrick
- **B.** Feed Frame
- **C.** Rotary or Auger Frame
- **D.** Pivot Areas for Mast Raise and Lower (Shear Pins)
- **E.** Hydraulics and Winches
- **F.** Spindle
- **G.** Rotary Drive Box
- **H.** Mechanical Drive Mechanisms from Power Source
- **I.** Ignition
- **J.** Hydraulic Controls - Control Panel
- **K.** Hydraulic Ram Extensions (Outriggers)
- **L.** Slide Base-Cross Slide Areas
- **M.** Cathead
- **N.** Hydraulic Valve Banks
- **O.** Gauges - Control Panel

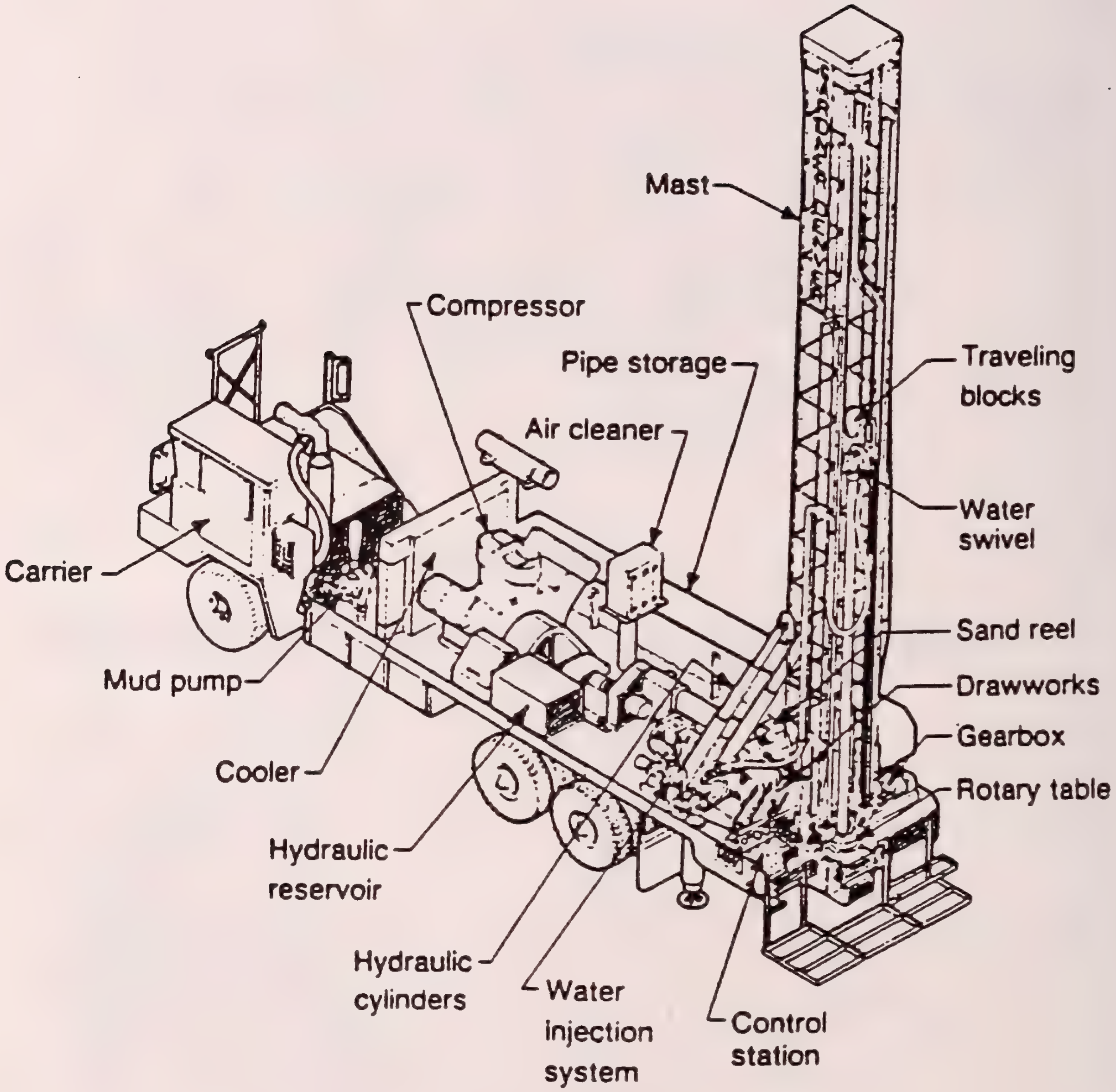
SOURCE: Valley Well Drilling, 1996

OGDEN

Hollow Stem Auger Drill Rig Operational Components

ATTACHMENT 2

DIRECT ROTARY RIG OPERATIONAL COMPONENTS



SOURCE: Valley Well Drilling, *Technical Approach to Drilling, Sampling, Monitor Well Installation, and Well Development*

OGDEN

Direct Rotary Rig Operational Components

ATTACHMENT 3

DAILY DRILL RIG CHECKLIST

OGDEN

DAILY DRILL RIG CHECKLIST

Date ____________________

Project # ____________________

Location ____________________

Rig Description ____________________

Serial or License # ____________________

(Note: This # should match the # on the equipment certification form.)

Rig Owner ____________________

Item Name	Requirement	Okay	No*	Comment
Hydraulic systems controls and levers	No leaking fittings or connections. Levers are in good operating condition. Fluid levels are full.			
Fuel, oil, water, and coolant lines	No leaks.			
Hoses	No leaks in hoses or connections. No signs of excessive wear, kinked or bent hoses.			
Gauges	Operational and visible to operator.			
Emergency kill switch and life line	Operational and accessible to operator.			
Shear pins	In place.			
Drive chains	No signs of excessive wear, broken or defective links.			
Parking brakes	Set and operational.			
Outriggers	No leaks. Set on pads (as necessary to avoid damage).			
Windshield wipers	Operational.			
Lights (head, tail and running lights)	Operational and without cracked lenses.			
Cables and ropes	No fraying, birdnesting, flattening, stretching. Must be braided or properly clamped at connections.			
Back-up alarm	Operational, spotter used.			

DAILY DRILL RIG CHECKLIST (Continued)

Item Name	Requirement	Okay	No*	Comment
Pulleys, drums and spools	No excessive wear or cracking.			
Derrick/Mast	Locked in position. Frame is not cracked or bent.			
Hoists	Properly spooled cable, rated to lift loads.			
Safety equipment	Safety harness, fire extinguisher, flares, safety reflectors, first aid kit, grounding wire for fueling, and spill response equipment (for fueling & repairs).			
Guards	Power take-offs (PTOs) and all rotating parts designed with guards. Guards must have warning labels.			
Miscellaneous (as applicable)	Diverter systems; auger and head seals; cyclones; grout plant guards; etc. (list):			

* Deficiencies (Explain all negative responses and list corrective actions; all deficiencies must be corrected before the rig is entered into service):

____

____

____

____

Other Repairs or Routine Maintenance: ________________________

____

____

____

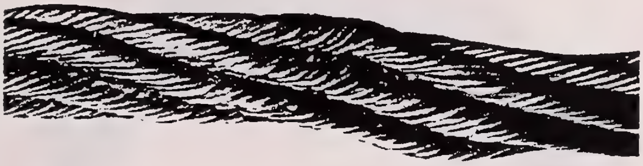
Inspection Conducted and
Rig Certified by:
(Owner/Operator) ________________________
Name and Date

Report Reviewed by:
(Ogden SHSC or FM) ________________________
Name and Date

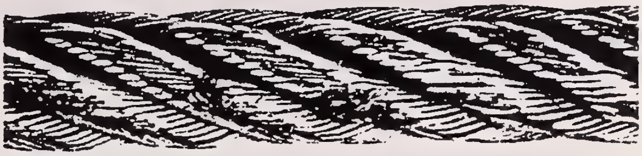
ATTACHMENT 4

WIRE ROPE WEAR AND DAMAGE

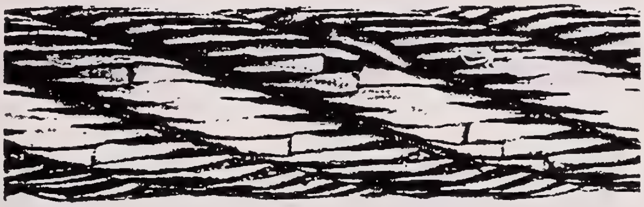
The evidence in these illustrations will aid the inspector in determining the actual cause of wear or damage in any wire rope.



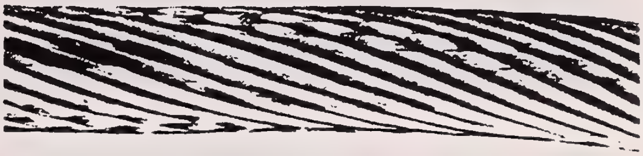
A wire rope which has been kinked. A kink is caused by pulling down a loop in a slack line during improper handling, installation, or operation. Note the distortion of the strands and individual wires. Early rope failure will undoubtedly occur at this point.



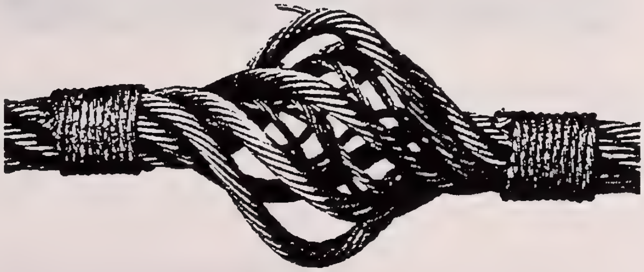
Localized wear over an equalizing sheave. The danger of this type wear is that it is not visible during operation of the rope. This emphasizes the need for regular inspection of this portion of an operating rope.



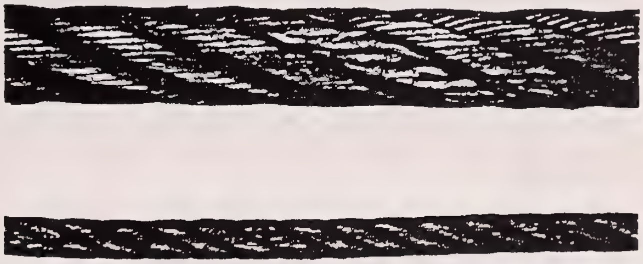
A typical failure of a rotary drill line with a poor cut-off practice. These wires have been subjected to excessive peening, causing fatigue type failures. A predetermined, regularly scheduled, cut-off practice will go far toward eliminating this type of break.



A single strand removed from a wire rope subjected to "strand nicking". This condition is a result of adjacent strands rubbing against one another and is usually caused by core failure due to continued operation of a rope under high tensile load. The ultimate result will be individual wire breaks in the valleys of the strands.



A "bird cage". Caused by sudden release of tension and resultant rebound of rope from overloaded condition. These strands and wires will not return to their original positions.



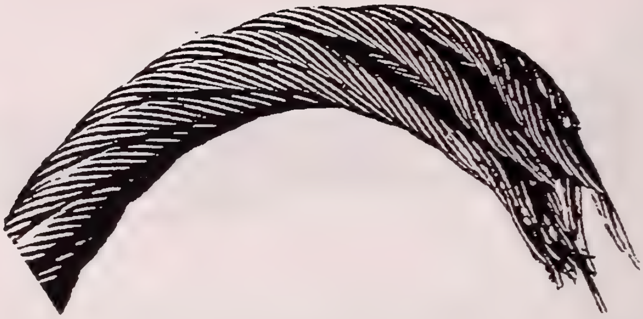
An example of a wire rope with a high strand – a condition in which one or two strands are worn before adjoining strands. This is caused by improper socketing or seizing, kinks, or dog legs. Picture A is a closeup of the concentration of wear and Picture B shows how it recurs in every sixth strand (in a six-strand rope).

SOURCES: 1992 National Safety Council "Accident Prevention Manual for Business and Industry: Engineering and Technology," and Wire Rope Corporation of America, Inc.

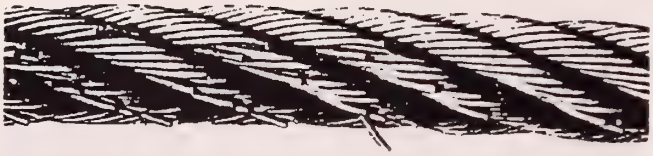
Wire Rope Wear and Damage
(part 1)

The evidence in these illustrations will aid the inspector in determining the actual cause of wear or damage in any wire rope.

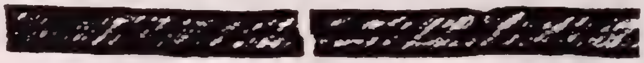
An illustration of a wire which has broken under tensile load in excess of its strength. It is typically recognized by the "cup and cone" appearance at the point of fracture. The necking down of the wire at the point of failure to form the cup and cone indicates that failure occurred while the wire retained its ductility.



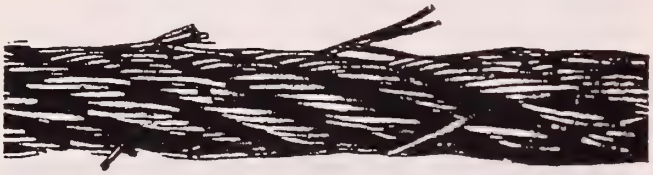
A wire rope which has jumped a sheave. The rope itself is deformed into a "curl" as if bent around a round shaft. Close examination of the wires shows two types of breaks - normal tensile "cup and cone" breaks and shear breaks which give the appearance of having been cut on an angle with a cold chisel.



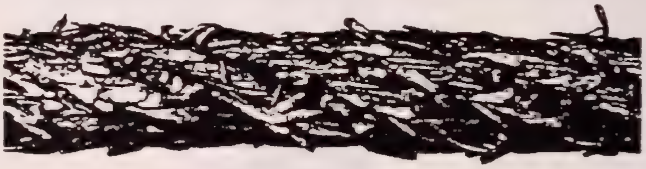
A wire rope which has been subjected to repeated bending over sheaves under normal loads. This results in "fatigue" breaks in individual wires – these breaks are square and usually in the crown of the strands.



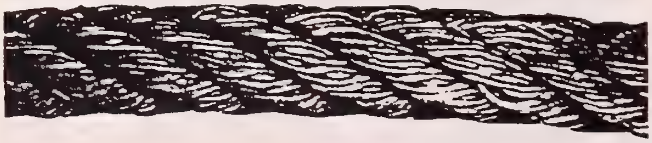
An illustration of a wire which shows a fatigue break. It is recognized by the squared off ends perpendicular to the wire. This break was produced by a torsion machine, which is used to measure the ductility. This break is similar to wire failures in the field caused by excessive bending.



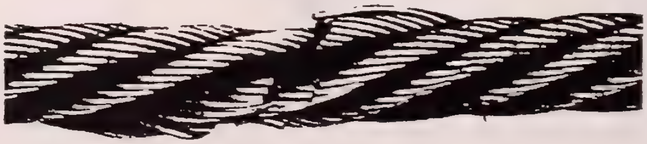
An example of "fatigue" failure of a wire rope which has been subjected to heavy loads over small sheaves. The usual crown breaks are accompanied by breaks in the valleys of the strands- these breaks are caused by "strand nicking" resulting from the heavy loads.



An example of a wire rope that has provided maximum service and is ready for replacement.



A close-up of a rope subjected to drum crushing. Note the distortion of the individual wires and displacement from their normal position. This is usually caused by the rope scrubbing on itself.



A fatigue break in a cable tool drill line caused by a tight kink developed in the rope during operation.

SOURCES: 1992 National Safety Council "Accident Prevention Manual for Business and Industry: Engineering and Technology," and Wire Rope Corporation of America, Inc.

ATTACHMENT 5

MACHINERY AND MECHANIZED EQUIPMENT CERTIFICATION FORM

MACHINERY & MECHANIZED EQUIPMENT CERTIFICATION FORM

To: Ogden Environmental and Energy Services Co., Purchasing Department

From:

1. This provides certification of machinery and mechanized equipment to be used on the referenced project for the following work:

Description of equipment work:

Project Site:

Subcontractor providing equipment:

Dates (duration) of equipment work:

2. Inspection and certification of machinery and mechanized equipment, as required by Ogden policy, Corporate Health and Safety Manual, Volume II, Comprehensive Field Project Health and Safety Program, has been made prior to, but not earlier than seven (advance) calendar days, of use on the project site. Recertification will be required for equipment that is used on the project site for more than one year.

Identification of equipment (make, model, serial no.)	Date of Certification
1.	
2.	
3.	
4.	
5.	
6.	

3. The above listed equipment has been inspected and tested as indicated above, and is CERTIFIED TO BE IN SAFE OPERATING CONDITION BY THE FOLLOWING COMPETENT INDIVIDUAL:

Name

Title

Firm

Signature

4. If there are any questions on this certification, please contact the following Ogden representative:

OGDEN

Distribution : Project Manager/Field Manager
Ogden Site Health and Safety Coordinator

OGDEN ENVIRONMENTAL AND ENERGY SERVICES

STANDARD OPERATING PROCEDURE

S.O.P. NO. S-8		PAGE 1	OF 12
EFFECTIVE DATE 10/1/96		REVISION NO. 0	
APPROVAL Denise L. Waggett, CIH			

ITLE

HOT WORK PERMITS

1.0 PURPOSE

The purpose of this procedure is to inform all personnel of the requirements and methods of an effective Hot Work Permit Program that complies with applicable sections of 29 CFR 1910 and 1926 and guidelines from the National Fire Protection Association (NFPA).

This procedure also describes an effective dedicated fire watch in accordance with applicable Occupational Safety and Health Administration (OSHA) regulations and NFPA standards. OEES policy is to establish clear requirements and procedures for granting internal Hot Work Permits and to administer an effective fire prevention and control program at each facility in order to prevent injury, loss of life, work interruptions, and property damage from unsafe welding, cutting, and other hot work activities. Other relevant sources of information include SOP ER-3, *Fire Prevention for Field Work*, the Hot Work and Fire and Explosion sections of Volume II, Comprehensive Field Project Health and Safety Program, of this manual, and the *Fire Prevention Plan* in Volume V, *Emergency Preparedness Program*, of this manual.

2.0 SCOPE

This procedure applies to all OEES personnel, personnel subcontracted to OEES, and visitors (including clients) who are engaged in hot work or fire watch activities.

3.0 DEFINITIONS

Approved Welding/Hot Work Area Shop – A shop or work area defined and segregated from non-weld areas by easily identified boundaries and approved by designated and authorized OEES management (Field Manager [FM] or Site Health and Safety Coordinator [SHSC]).

Arc – A controlled electrical discharge between the electrode and the workpiece that is formed and sustained by a gas that has been heated to such a temperature that it can conduct electric current.

Arc Cutting – A thermal cutting process that severs or removes metal by melting with the heat of an arc between an electrode and the workpiece.

Arc Welding – A welding process that joins workpieces by heating them with an arc.

Authority Having Jurisdiction – The designated person at each project site to contact about fire protection.

Authorized Personnel – The person, employed by OEES or a subcontractor, who is authorized, trained, and qualified to perform the hot work.

Brazing – A welding process that joins materials by heating them to a temperature which will not melt them but will melt a filler material which adheres to them and forms a joint.

Combustible and Flammable Material – Any solid, liquid, or gas that can ignite when brought into contact with flames, sparks, hot slag, or other sources of ignition. A combustible material has a flash point greater than 100°F and a flammable material has a flash point less than 100°F.

Dedicated Fire Watch – A person trained in fire prevention and suppression who is designated to perform duties of a fire watch during the hot work and for 30 minutes following the hot work, including site preparation, observing the hot work, and properly reacting to any emergency situation that may occur at the site during or after welding, burning, or other hot work operations.

Effective Date – The date for which the hot work permit is valid.

Gas Metal Arc Welding – An arc welding process that uses an arc between a continuous filler metal electrode and the weld pool; the process is used without shielding from an externally supplied gas.

Heating Torch – A device for directing the heating flame produced by the controlled combustion of fuel gases.

Hot Work – All spark-producing and open-flame operations including methods of welding, arc and torch cutting, abrasive cutting, open flame brazing, burning, soldering, and other portable torch open flames, including hot slag.

Hot Work Permit – The front side of the two-sided "Hot Work Permit" (Attachment 1) shall be filled out completely, signed, and issued by the appropriate individuals in accordance with this procedure. As soon as the job site and/or permanent weld shop has been properly prepared for hot work, the back side of the permit is completed, signed, and implemented by either the FM or subcontractor. The permit shall then be attached to the hot work equipment being used in the operation.

Oxyfuel Gas Cutting – An oxygen cutting process that uses heat from an oxyfuel gas flame.

Oxyfuel Gas Welding – Welding process that joins workpieces by heating them with an oxyfuel gas flame.

Soldering – A welding process that joins materials by heating them to a temperature which will not melt them but will melt a filler material which adheres to them and forms a joint.

4.0 RESPONSIBILITIES

4.1 OEES SUPERVISORS

OEES management is responsible for identifying and training appropriate dedicated fire watch personnel, supporting the dedicated fire watch procedure for OEES personnel, and ensuring that subcontractors are aware of this policy.

4.2 HEALTH AND SAFETY MANAGER (HSM)

The HSM is responsible for ensuring that the Hot Work Permit Program complies with federal and state OSHA.

4.3 PROJECT MANAGER (PM)

The PM is responsible for incorporating the requirements of this procedure into project plans, budgets, and activities. He/She is also responsible for providing the personnel, funds, and management support needed to implement the Hot Work Permit Programs. The PM conducts assessments of hot work.

4.4 FIELD MANAGER (FM)/CONSTRUCTION SUPERVISOR (CS)

The FM/CS is responsible for completing, signing, and issuing Hot Work Permits. He/She inspects a hot work area thoroughly and ensures that all work is performed in conformance with the Hot Work Permit (Attachment 1). The FM/CS is responsible for determining if any other jurisdictions (fire marshal, etc.) have Hot Work Permit policies that apply. The FM/CS, along with the SHSC and PM, is responsible for implementing this procedure and assessing the fire watch and fire reporting policies.

4.5 SITE HEALTH AND SAFETY COORDINATOR (SHSC)

The SHSC is responsible for implementing and enforcing this procedure during project operations and activities as directed by the HSM. The SHSC also conducts air monitoring when necessary to secure the Hot Work Permit. He/She coordinates all safety-related activities that involve hot work and Hot Work Permits and keeps a file of all permits issued for the site.

4.6 SUBCONTRACTOR

Subcontractor personnel are responsible for ensuring that work performed by the craft workers under their supervision conforms with the requirements of the Hot Work Permit. The subcontractor ensures that craft work is carefully planned and coordinated with the OEES FM/CS. Each step must be well defined, justifiable, and safe.

Finally, subcontractors are responsible for:

- initiating the Hot Work Permit for all welding, cutting, or other defined hot work to be performed by their employees

- signing the completed permit and reviewing it with the FM/CS before beginning the work

- inspecting the hot work area before starting work under the permit

- ensuring that no welding, cutting, or other defined hot work is performed at any time without a current and properly completed Hot Work Permit

- ensuring that only authorized subcontractor personnel perform hot work; authorized personnel are persons who are qualified, have received hot work training, and were specifically assigned to perform the hot work

- maintaining a file of Hot Work Permits for 30 days after they expire

- forwarding the permit (or a copy) to the authority having jurisdiction (see Section 3)

All craft workers are responsible for reading and complying with all Hot Work Permit restrictions. They must report to the SHSC or FM/CS before starting hot work, when leaving the job site, and before resuming hot work.

Craft workers are also responsible for waiting to begin welding, cutting, or other defined hot work, until a current, completed, Hot Work Permit is attached to the welding rig, cutting torch, or other tool to be used in the operation.

Craft workers are responsible for:

- reporting to their immediate supervisor all unapproved or unusual conditions and situations related to the operation for shutting down machines, power tools, welding rigs, etc.,
- when they leave the job site, and
- keeping the work area clean.

The immediate supervisor shall report any unapproved or unusual conditions or situations to the FM/CS or SHSC for discussion and resolution.

4.7 DEDICATED FIRE WATCH PERSONNEL

Dedicated fire watch personnel are responsible for preparing the area for hot work operations, observing the activity as the hot work progresses, and inspecting the area for sources of ignition for 30 minutes after hot work is complete.

Dedicated fire watch personnel are also responsible for reporting to their immediate supervisor any conditions or actions that violate the Hot Work Permit Program and for preventing the initiation of hot work at any time without a current, completed Hot Work Permit attached to the welding rig, cutting torch, etc. The name of the dedicated fire watch/ safety observer shall be entered on the appropriate line of the Hot Work Permit.

5.0 PROCEDURE

5.1 HOT WORK PERMITS

The Hot Work Permit is an OEES requirement. Regardless of whether a Hot Work Permit is required or not by an outside agency or client, site workers must always comply with the Hot Work Permit as an OEES policy.

Hot Work Permits (Attachment 1) may be issued for a maximum of 24 hours. The permit must be initiated by the subcontractor and completed by the FM/CS. Any extension of time beyond 24 hours must be approved by the SHSC. The permit itself is two-sided; the front is the permit and the back gives instructions for filling it out. The permit should be protected from sun, wind, and rain, as appropriate, by inserting it in a plastic enclosure.

5.2 PERSONAL PROTECTIVE EQUIPMENT

Welding presents a problem in the control of infrared (IR), ultraviolet (UV), and intense visible radiation. Some types of hot work, such as heavy gas welding and cutting, and arc-cutting and welding, also present a problem in the control of UV radiation. Hot work activities may generate noise levels greater than 85 dBA. To protect against excessive noise exposure, hearing protective devices will be used when needed. Eye protection will protect the eyes from slag and sparks, as well as radiation. Helmets, face shields, and safety glasses can protect the eyes from UV and visible radiation and sparks. Filter lenses or windows should be selected based upon the type of hot work being performed. The shield should be made of nonflammable material, opaque to radiation, and a poor heat conductor. The chemical composition of a lens, not its color, provides the filtering effect.

Respiratory protection capable of being worn under the welding helmet, of the air-purifying or air-supplied type, depending on the hazard, must be worn when the action levels established in the site-specific Health and Safety Plan (HSP) are exceeded. Anytime hot work is performed in an enclosed space, air-supplied respiratory support shall be worn. Leather guards and coveralls provide protection against UV radiation and IR radiation (thermal heat).

5.3 DEDICATED FIRE WATCH

A dedicated fire watch is required when hot work is performed in locations where other than a minor fire might develop, or:

- appreciable combustible material, in building construction or contents, is closer than 35 feet to the point of operation
- appreciable combustibles are more than 35 feet away but are easily ignited by sparks
- wall and floor openings are within a 35-foot radius and expose combustible materials in adjacent areas including concealed spaces in walls and floors
- combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and are likely to be ignited by conduction or radiation

The following procedure is to be closely followed by the dedicated fire watch when hot work is being performed.

1. Ensure that a valid OEES Hot Work Permit has been properly completed, issued, and posted before the hot work starts.

2. Before the hot work starts, inspect the work area for any condition that could contribute to a fire during the work.

3. Prepare the work site for the job by removing all combustible materials to a safe location away from the work site as follows: combustible solids, 35 feet away; combustible liquids, 50 feet away. Sweep and wet down the floor, if necessary.

4. Use approved, fire retardant drop cloths to cover floors, permanently-installed equipment, and combustibles that cannot be removed from the immediate work site.

5. Ensure that workers keep the work area clean and properly store materials.

6. Ensure that no one is eating, drinking, or smoking in the vicinity of the hot work.

7. Ensure that a sufficient number of the appropriate type of fire extinguishers are available and accessible for immediate use should a fire occur during welding, cutting, or other hot work operations. The SHSC will determine the number, size, and types of extinguishers needed for each job.

NOTE: Additional extinguishers beyond those used for fixed building protection must be provided for fire watch purposes.

8. Check that all compressed gas cylinders at the job site are handled, used, stored, and disposed of properly, as recommended by the Material Safety Data Sheet (MSDS).

9. Assist the person welding, burning, or doing other hot work by assuring that valves, regulators, hoses, and backflow preventers are in good repair and ready for safe operation.

10. If there is a sprinkler system in the area, ensure that it works and that the sprinkler heads are unobstructed by materials or equipment.

11. Survey the work area for existence of a smoke or heat detection system. If the system must be disabled during the hot work, then the dedicated fire

watch shall be capable of manually actuating the system in the event of a fire emergency.

12. Cover all openings in the walls, ducts, pipes, floors, ceiling, etc., within 35 feet of the welding, cutting, or other hot work activities with approved fire retardant cloths to prevent sparks or hot slag from dropping or entering adjoining areas.

13. Perform the dedicated fire watch duties (Section 4.8) during and for 30 minutes after the hot work.

14. Report promptly to the appropriate supervisor any serious violation of fire prevention requirements and any unusual conditions or actions.

15. Know the location of the nearest fire reporting equipment (alarm pull box, telephone [911], etc.) and be familiar with the procedure for directing the response team to the proper location in case of a fire. (See Section 5.4)

16. If hot work is being performed in a confined space, the procedures in SOP S-1, *Confined Space Entry*, must also be followed, and both permits (Hot Work and Confined Space Entry) must be initiated, approved, and posted.

5.4 FIRE REPORTING MEASURES

The dedicated fire watch shall be on alert for fires in all exposed areas and shall sound the alarm immediately when a fire is discovered. Dedicated fire watch personnel should attempt to extinguish a fire only if it is clearly within their capabilities and training and the capability of the available fire protection equipment. Specific instructions for responding to fires is provided in the site-specific HSP, as well as in the *Emergency Preparedness Program* (Volume V) of this manual, *Emergency Action Plan* and *Fire Prevention Plan*, SOP ER-2, *Emergency Action Plan for Field Operations*, and SOP ER-3, *Fire Prevention for Field Work.*

5.4.1 Steps for Sounding Alarm

1. Respond immediately by pulling the lever on the nearest fire alarm box or by calling 911 or the fire department of the facility in which the fire is burning.

- Give your name and location.
- Describe the fire.
- Remain on the telephone until released by the person receiving the call.

2. Evacuate personnel, if necessary.

3. Notify the local supervisor of the area where the fire is.

4. Have the FM meet the emergency personnel and lead them to the fire.

5. After reporting a fire, try to extinguish or control the fire only if it can be done safely and only until fire department personnel arrive at the scene.

6. Complete and submit to the HSM within 24 hours the appropriate forms, as required by SOP A-3, *Injury or Illness Reporting*.

5.5 TRAINING REQUIREMENTS FOR FIRE WATCH

The dedicated fire watch will be trained in fire extinguisher use, first aid, CPR, and bloodborne pathogen exposure control. The dedicated fire watch will also be trained in emergency response as it relates to the hazards of the hot work being performed.

6.0 RECORDS

Where applicable, the following documents shall be retained as records:

- Hot Work Permits
- Air monitoring records
- Incident Reports
- Supervisor's Reports of Injury or Illness and First-aid Incident Reports
- All field notes, records, and logs that apply to hot work
- Training records

A copy of the Hot Work Permit shall be posted at the hot work site for the duration of the work or the effective date, whichever is shorter. A second copy of all Hot Work Permits issued shall be kept in the SHSC files.

7.0 REFERENCES

Fed-OSHA. 1995. 29 CFR 1910, Subpart Q, *Welding, Cutting, and Brazing.*

Fed-OSHA. 1995. 29 CFR 1926, Subpart J, *Welding and Cutting.* Safety and Health Regulations for Construction.

NFPA Standard 51B, *Fire Prevention in the Use of Cutting, Welding Processes.*

National Safety Council Data Sheet 491, *Fire Prevention and Control at Construction Sites.*

National Safety Council. 1992. *Accident Prevention Manual for Business and Industry: Engineering and Technology.* 10th ed.

U.S. Army Corps of Engineers. 1992. *Safety and Health Requirements Manual, EM 385-1-1.*

8.0 ATTACHMENTS

1. Hot Work Permit

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ATTACHMENT 1

HOT WORK PERMIT

HOT WORK
(FLAME OR SPARK PRODUCING ACTIVITIES)
PERMIT

NOTE: THIS PERMIT IS GOOD FOR ONLY 24 hours
UNLESS PERMIT EXTENSION (BELOW) IS SIGNED

DATE: ____________________ **No.:** ________________

START DATE: ________________ START TIME: _________ AM/PM
PERMISSION GIVEN TO: ____________________________________
OF (Co.) __________________________ GROUP: ______________
JOB/LOCATION OF BOUNDARIES ______________________________

WORK DESCRIPTION ____

EQUIPMENT TO BE USED ____________________________________

VIOLATION OF ANY PERMIT REQUIREMENTS WILL BE CAUSE FOR DISCIPLINARY ACTION.

(√) if required or "N/A"	Initials	The Field Manager (FM) and Site Health and Safety Coordinator (SHSC) must check requirements below and initial after requirements have been met and **before this permit is valid**.
		Combustible gas test required initially. Time: ______________
		(Plus every __________hrs.)
		Continuous explosivity monitoring required at site.
		Safety observer (dedicated fire watch) Name: ______________
		Fireproof blanket.
		Fire extinguisher _______________ (type/size)
		Lines disconnected and blanked.
		Respiratory Protection:._____________________ (type)
		Vessels and/or area clean of oil/combustibles.
		Vehicle entry permit.
		Fire protection services taken out of service.
		Inert gas purge required.
		Confined space entry permit.
		Distance of operation from flammables/combustibles.
		Lock out/tag out.
		Area to be roped off or otherwise isolated.
		Other special requirements

Permit Initiated by:________________ Co.: ____

Necessary restrictions are specified, requirements are met, and hot work may safely

begin (SHSC/FM)____

HOT WORK WILL NOT BEGIN UNTIL REQUIREMENTS ARE MET, APPROVAL SIGNATURES ARE OBTAINED, AND PERMIT IS POSTED AT THE JOB SITE.

PERMIT EXTENSION

This permit has been extended for the period ____/____/____ from _______AM/PM to _______ AM/PM **only:**

Approved by (SHSC/FM): ______________________________

OGDEN

INSTRUCTIONS FOR USE OF THIS PERMIT

This permit is to be used to control work which requires the use of sources of ignition within or near the "Exclusion Zone" by Company or Contractor personnel. Examples are:

1. Welding, burning, cutting, grinding, or soldering.
2. Sparks from power tools.
3. Electrical equipment not approved for hazardous areas.
4. Explosives, chemical fire hazards.
5. Motorized equipment used in Exclusion Zone.

Process, then post this permit at job site before work starts. If area becomes unsafe or permit conditions are not being met, anyone may pull the permit, stop all work, and notify the FM or SHSC.

CAUTION

If an area becomes unsafe or permit conditions are not being met, anyone may pull the permit, stop all work, and notify the FM or SHSC.

CONTRACTOR MUST:

1. Initiate permit, ensure that job is well defined, justifiable and can be done safely.
2. Fill in the upper section then SIGN "requested by".
3. Review permit with FM the day before work is to be done. Give operations extra lead time if fire watch/standby manpower is required.
4. Ensure that craftsmen and the safety observer (dedicated fire watch) understand job boundaries, work precautions, restrictions and conditions.
5. Prepare job site for work. Have required materials ready.

SHSC or FM MUST:

1. Review permit with initiator to ensure work is defined, justifiable and can be done safely. Advise client contact, as required, of any unusual hot work planned.
2. Specify "Restrictions Required" via checks in boxes provided, non-applicable restrictions must be labeled as N/A.
3. Arrange for dedicated fire watch/safety observer as required.
4. Sign: "approved by" and date on line provided.
5. Ensure administrative training requirements have been met.

THE CRAFTSMAN MUST:

1. Be aware of all permit restrictions.
2. Report to the SHSC or FM before starting hot work, when leaving job site, and before resuming any hot work.
3. Shut down machines, power tools, welding rigs, etc., when leaving job site.
4. Keep work area clean.

SHSC	*Site Health & Safety Coordinator*
FM	*Field Manager*
Co	*Contractor or Company*

OGDEN

OGDEN ENVIRONMENTAL AND ENERGY SERVICES

STANDARD OPERATING PROCEDURE

S.O.P. NO. S-9

PAGE 1 OF 10

EFFECTIVE DATE 2/18/97

REVISION NO. 0

APPROVAL Duane L. Doggett, CIH

TITLE

ORDNANCE DISCOVERY

1.0 PURPOSE

This procedure establishes the minimum requirements for the protection of employees working in areas where explosive ordnance may be present.

2.0 SCOPE

This procedure applies to all OEES personnel, personnel subcontracted to OEES, and visitors (including clients) who may work on or visit OEES jobsites where explosive ordnance may be present.

3.0 DEFINITIONS

Electromagnetic Radiation (EMR) - Type of radiation given off by certain cellular phones and radios. May trigger unexploded ordnance that are sensitive to it.

Explosive Ordnance - Military weapons that, either on impact or when detonated, burst from internal pressure. Could include artillery, booby traps, land mines, aerial-dropped bombs, projectiles, and torpedoes that have not exploded or that have exploded but that still contain live components. May be found on land and offshore. See Attachment 1 for examples of types of explosive ordnance. Explosive ordnance can be found in varying sizes.

Unexploded Ordnance (UXO) Disposal Unit - The agency having jurisdiction over explosive ordnance disposal when discovered on non-military property.

Explosive Ordnance Disposal (EOD) Unit - The military unit having jurisdiction over explosive ordnance disposal when discovered on military property.

High Hazard Area - An area that contains hazards beyond what may be taken into account (or reduced) by training or safety means. This type of area has a high hazard rating which means that the government has been unable, or it was not feasible, to attempt to reduce the explosive ordnance hazards.

Low Hazard Area - An area that has a hazard rating of low, meaning the government has taken reasonable and prudent measures to reduce the element of hazard to a less than significant level of risk, consistent with generally accepted standards that may be applicable. The low rating applies to personnel trained in explosive ordnance identification and who are performing authorized duties while in these areas.

4.0 RESPONSIBILITIES

4.1 HEALTH AND SAFETY MANAGER (HSM)

The HSM may audit regarding the implementation of this SOP to ensure compliance at a field site. The HSM authorizes any deviation or modification of this SOP during field operations. The HSM receives reports of observations of explosive ordnance at project sites.

4.2 PROJECT MANAGER (PM)

The PM or his/her designee is responsible for preparing and transmitting (for the affected field crew) the written request to the UXO disposal/EOD team for an in-brief. The PM is also responsible for ensuring that explosive ordnance response procedures are stated in the site-specific health and safety plan (HSP) and that personnel comply with assigned duties stated in the HSP. The PM ensures that explosive ordnance response training is provided for site workers during the kick-off meeting and subsequent tailgate safety meetings for projects that take place in areas where explosive ordnance could be present.

4.3 SITE HEALTH AND SAFETY COORDINATOR (SHSC)

The SHSC may provide explosive ordnance response training of site workers during the kick-off meeting and subsequent tailgate safety meetings for projects that take place in areas where explosive ordnance could be present. The SHSC is also responsible for distributing information, such as Attachment 1, Types of Explosive Ordnance, and

Attachment 2, Examples of Explosive Munition Classified by Mode of Delivery. The SHSC assists the PM or Field Manager in the response to explosive ordnance discovery.

4.4 FIELD MANAGER (FM)

When explosive ordnance is discovered, the FM will cease operations in the area and document the incident on the Potential Explosive Ordnance Discovery Report (Attachment 3) and Incident Report (Attachment 4) forms. The FM will serve as the primary Emergency Coordinator, as discussed in the Emergency Response section of the site-specific HSP, and contact for investigations of all ordnance discovery incidents.

4.5 EMPLOYEES AND SUBCONTRACTORS

All site workers are responsible for being on the alert for potential explosive ordnance, adhering to the correct notification and response procedures, evacuating to a safe refuge area, accounting for missing personnel, and preventing unauthorized entry to the site.

5.0 PROCEDURE

5.1 EMERGENCY PRE-PLANNING

Where there is a reasonable potential for explosive ordnance discovery onsite, an in-brief, provided by a civilian UXO authority or Military EOD Unit, for the area shall be required for all OEES and subcontracting personnel prior to initiation of any site work. EOD teams will provide in-briefings only when requested by a U.S. Government Agency. The HSM is responsible for transmitting the request prepared by the PM to the responsible authority.

A typical in-briefing by the UXO/EOD team will include the following:

- Type of ordnance and/or explosive items that have been found in the past.
- Number of items that have been found at the project site and in the area.
- Telephone numbers to activate the UXO/EOD team into action. Local police departments can be called for information regarding UXO team response. If

the discovery or siting is on a military base, typically the corresponding Base Security is first notified in order to determine if an EOD team is required.

- Safe refuge areas that will be utilized to retreat from the explosive areas. The safety areas are established by the size of the explosive item encountered to ensure that no fragmentation reaches that area.

5.2 ENTRY POLICY INTO EXPLOSIVE ORDNANCE AREAS

If an area is suspected to contain explosive ordnance, the following policy must be adhered to:

- Entry to the area is restricted to daylight hours only.

- Vehicles must remain on roadways or designated jeep trails (i.e., no off-roading allowed).

- Personnel must remain in groups of two or more, and remain in the sight of their partners.

- Personnel must maintain clear communications with UXO/EOD unit (i.e., set times to check in with the UXO/EOD unit) and have a working knowledge of radio commands. If communications are lost or emergencies occur, personnel will return to the point where they last had contact with UXO/EOD unit. If they are still unable to make contact, the personnel will exit the area and reestablish communications.

- Proper equipment must be maintained in an accessible location at all times. This equipment at a minimum shall include:

  - Two cellular phones with extra batteries (Note: refer to Step 8, Section 5.3 and EMR definition, Section 3.0);

  - A first-aid kit;

  - Properly functioning and fueled vehicle; and

  - Planning documents including work plan and HSP

- Report unusual findings (e.g., white phosphorous is a common element of ordnance that produces a bright white smoke. Signs of white phosphorous in the area include sparking and popping as you walk and white crystals on the ground. If any of these signs are present, immediately exit the area and report the signs to the UXO/EOD unit. Inhalation of white phosphorous smoke may result in burning of the lungs known as "dry land drowning.")

- Stay away from sighted explosive ordnance; do not pick it up or take it with you (see Section 5.3, Discovery of Potential Ordnance).

5.3 DISCOVERY OF POTENTIAL ORDNANCE

Examples of explosive ordnance by type and by mode of delivery are provided in Attachments 1 and 2, respectively. Attachment 3, Photographs of Explosive Ordnance, provides additional examples of explosive ordnance that could be found on project sites. If potential ordnance is located, the following procedures and steps shall be followed. (**IMPORTANT NOTE**: The majority of mishaps with unexploded ordnance are due to curious people trying to investigate their discovery.)

CAUTIONARY NOTES

a. Regardless of how long the item has been there, it may still be sensitive to minute changes in temperature and vibration from movement.

b. Static electricity from touching may trigger certain explosive ordnance (e.g., point detonating munitions).

c. Due to the age and the inherent properties of explosives, exposure to harsh environments (i.e., extreme hot or cold temperatures, extreme moisture, etc.) may produce explosive salts. These salts often prove to be more sensitive than the original explosive.

d. The item may be “booby-trapped” or, for mechanical reasons, may detonate if moved. Any effort to tamper with or investigate the explosive could result in immediate detonation.

Step 1: Make NO attempt to move, uncover, recover, or disturb the item which has been found. If the item was unearthed by excavation using earthmoving equipment, DO NOT dump the load from the bucket. Simply lower the bucket and leave it.

Step 2: Position a distinct marker near the item (NOT ON THE OBJECT), generally 7-10 feet away. This item should be non-metallic such as a piece of tape, spray paint, heavy fabric, a marked rock, etc. If using flagging tape, be sure it is unique from other flagging tape in the area. The marker must be heavy enough to remain in place through wind and not wash away in heavy rains. If using wooden stakes, do not pound them into the ground. Explosive ordnance may be sensitive to vibrations.

Step 3: DO NOT TOUCH THE OBJECT. Pushing the item into the soil could cause it to explode. The fact that the item did not explode when first discovered does not mean it is stable -- it still could explode at the slightest disturbance.

Step 4: While remaining in the exact position upon discovery of the ordnance (kneeling, squatting, standing), look for anything unusual (wires on the ground, in trees, etc.). Do not make any quick moves and check the immediate area before moving your feet. If other items are seen, note their position and relationship to the first item. MAKE NO ATTEMPT TO MOVE TOWARD THE OTHER OBJECTS. If your feet become tangled in wires hooked up to a suspected explosive ordnance, do not panic. Carefully untangle your feet and back away from the item.

Step 5: Note the following on all objects found or seen (estimate or guess these parameters, do not take the time to make exact measurements or move the item) by recording the information on a Potential Explosive Ordnance Discovery Report (Attachment 4):

- Shape: Cylindrical, square, etc.
- Size: Length, height, width.

- Color of the item. The following are some common color codes for military ordnance:
  - Blue - practice rounds, does not mean munition is safe.
  - Olive green and yellow with yellow writing - high explosives.
  - Black with white writing - Heat munition, the only way to tell if these rounds are live is to X-ray them in the field.
  - Lime green with red writing - white phosphorous munition.
  - White with black writing - illumination munition.
  - Gray with red band - chemical munition, generally tear gas.
- Any specific color marking on the body of the item.
- Visual numbers or letters.
- Orientation of item using a clock face, e.g., 1:00, 2:00, etc.
- Approximate depth at which the item was uncovered.
- Type of soil: Hard coral, soft sand, etc.
- Case condition: Has the case been split or does it appear to be intact?
- Any obvious deterioration of the case: Has the case begun to rust, etc.?
- Any obvious unlike materials which go together on the case (e.g., rusty body with a copper or brass topping cone which might be the fuse).
- Note any contact (unintentional or intentional) that was made with the item.

The above information is critical and will be used to assist the UXO/EOD team with their preparations before going in and clearing the item (Step 9). It will also give them a rough idea of the approximate explosive charge. This information may also immediately inform them whether the item is inert or a practice round.

Step 6: With this information in hand, retreat from the area retracing your footprints until you are once again on a normally and frequently used path, trail, or road. This action is necessary because in getting to this area, you may have stepped over other ordnance and/or explosive items.

Step 7: Move all personnel and equipment to the safe refuge area, located at least 300 feet from the explosive ordnance location, identified in the HSP (as amended by the in-brief for the area).

Step 8: Once personnel are at least 50 feet away from the item (this distance is critical as EMR may trigger certain types of explosive ordnance [e.g., point detonating munitions]), notify the following personnel immediately:

- Military Base Security, civilian police department, and/or UXO/EOD team (as determined in the in-brief). Provide all information gathered in Step 5.

- Project Manager (who will notify the client).

- Health and Safety Manager.

Step 9: Take the necessary steps to ensure that others in the immediate area are alerted to the possible explosive item(s) and do not venture into the area until it has been subsequently cleared by Military Base Security/Police Department and/or UXO/EOD teams. If adjacent to other active operations, this notification shall be coordinated with the designated responsible party.

Step 10: Wait for the security/police or UXO/EOD representative(s). Upon arrival:

- Provide them with the Site Visitor Health & Safety Orientation form, which they must read and sign.

- Inform UXO/EOD representative of appropriate personal protective equipment (PPE) to protect against any site chemical or physical hazard.

- Point the UXO/EOD representative(s) in the direction of the marked area and remain in the safe refuge area.

- Do not resume work until the area has been declared "all clear" by the security/police or UXO/EOD representative(s). Verbal notification is acceptable.

Step 11: Complete the Incident Report detailing the encounter. Immediately fax/forward to the Corporate Health and Safety Director, HSM, and office Health and Safety Coordinator.

Step 12 (Optional): If specified by the HSM in conjunction with the PM, request an area sweep to ensure the explosive item(s) have been cleared and no other ordnance is present. This request:

- Must be in writing to the responsible authority, transmitted via the HSM.

- Must include a request for verbal and/or written notification that the item(s) in the area have been cleared and that it is safe for work to be resumed.

NOTE: In some military areas, civilian contractors may be performing range clearances under the direction of Explosive Ordnance Groups. Items discovered may include new ordnance (often referred to as a "shape"), an expended piece of ordnance, and in some cases old World War II rounds which dropped leaflets. If the item you discover fits one of these categories, the EOD team will simply come by and remove it from the area. They will perform an area sweep (if formally requested to do so in Step 12) and declare that the area is clear for operations.

6.0 RECORDS

Upon discovery of potential explosive ordnance, the FM will complete a Potential Explosive Ordnance Discovery Report (Attachment 4). In the event that explosive ordnance is discovered, an Incident Report (Attachment 5) will be completed by the FM and submitted to the appropriate personnel. Should any injuries result from the discovery of the explosive ordnance, the appropriate injury and first-aid forms will be completed by the FM and submitted as outlined in SOP A-3, *Injury or Illness Reporting,* or Volume II, *Comprehensive Field Project Health and Safety Program,* of the Corporate Health and Safety Manual.

7.0 REFERENCES

Explosive Ordnance Disposal Mobile Unit Five Detachment Guam.

Explosive Ordnance Disposal Team, Marine Corps Base, Camp Pendleton, California.

Ogden. 1996. PACDIV CLEAN Program Ordnance Discovery SOP. HSP-17. October.

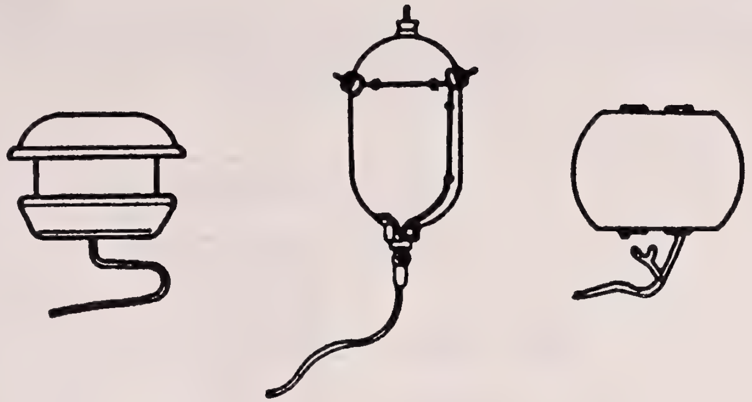
UNC Sea Grant Publication, UNC-SG-81-05, A Fisherman's Guide to Explosive Ordnance.

8.0 ATTACHMENTS

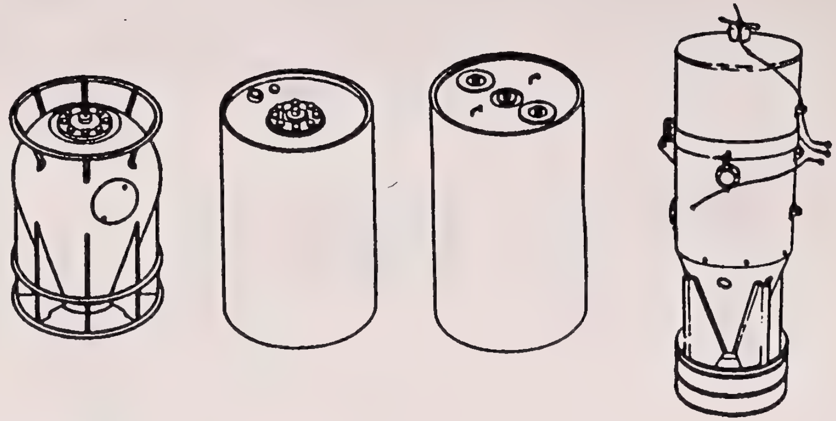
1. Types of Explosive Ordnance
2. Examples of Explosive Munition Classified by Mode of Delivery
3. Photographs of Explosive Ordnance
4. Potential Explosive Ordnance Discovery Report
5. Incident Report

ATTACHMENT 1

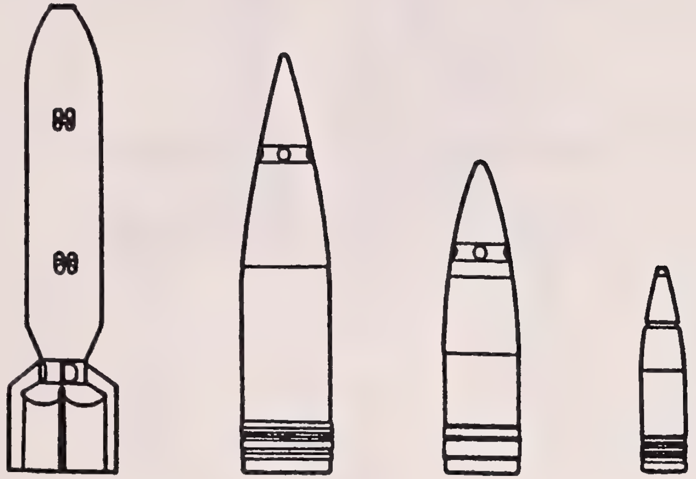
TYPES OF EXPLOSIVE ORDNANCE



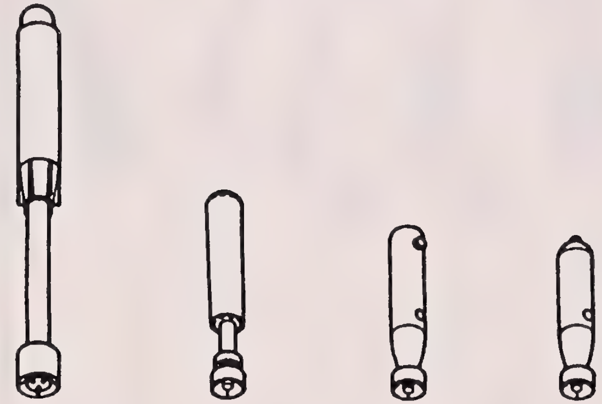
Miscellaneous Mine Floats



Depth Charges and Bomb



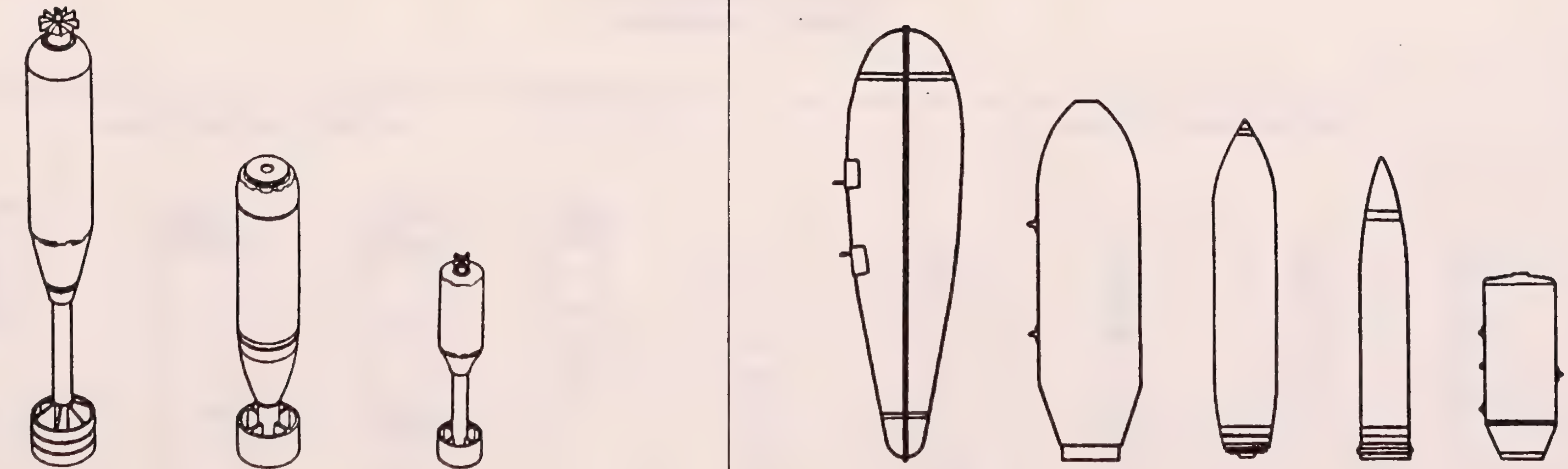
Aerial Bomb and Projectiles



Practice Depth Charges

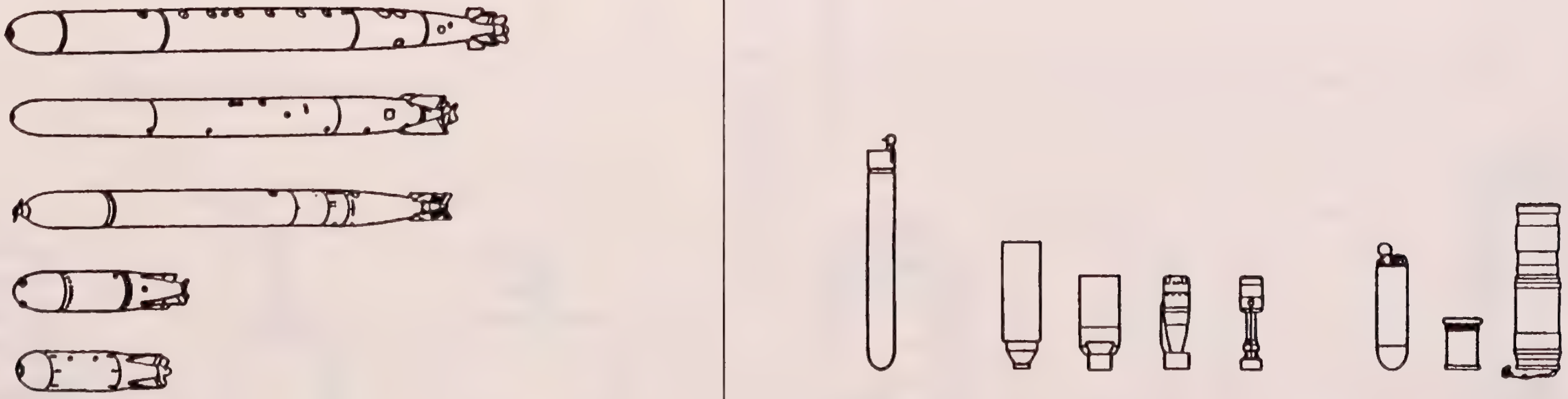
SOURCE: UNC Sea Grant Publication, UNC-SG-81-05, A Fisherman's Guide to Explosive Ordnance.

Attachment 1 (part1)
Types of Explosive Ordnance



Projected Anti-Submarine-Warfare Weapons

Aerial Bombs without Fins



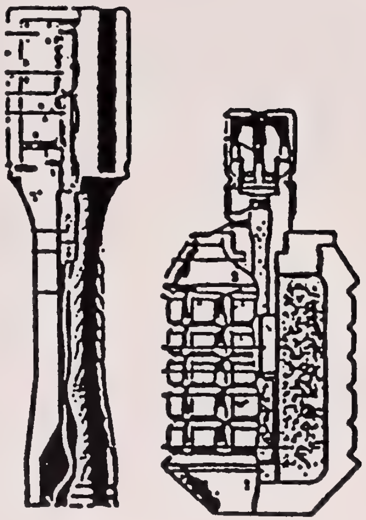
Representative Torpedoes

Markers and Signals

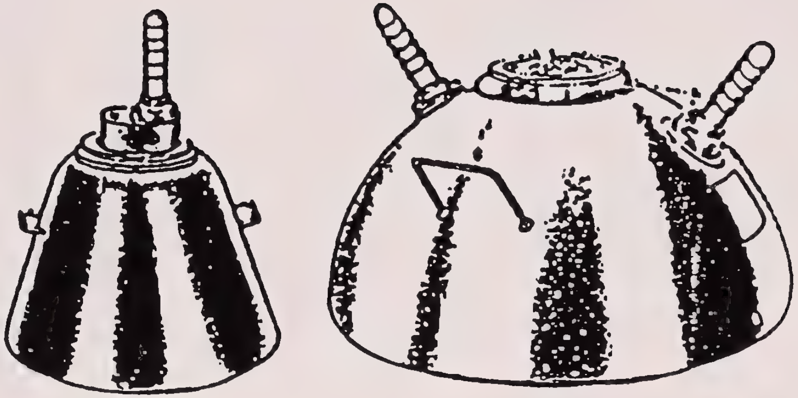
SOURCE: UNC Sea Grant Publication, UNC-SG-81-05, A Fisherman's Guide to Explosive Ordnance.

Attachment 1 (part 2)
Types of Explosive Ordnance

Hand Grenade



Land Mines

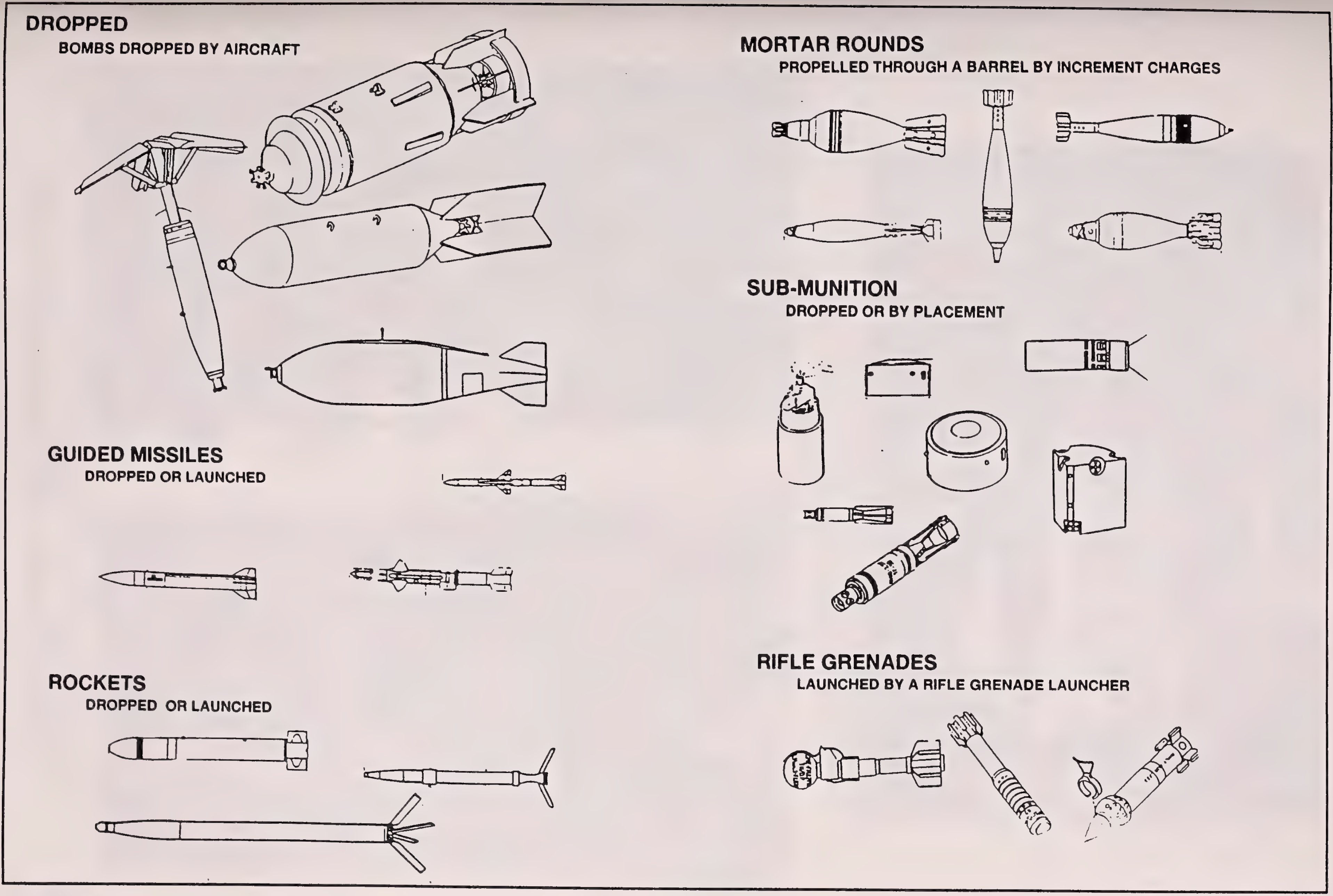


SOURCE: Explosive Ordnance Disposal Mobile Unit FIVE Detachment Guam.

Attachment 1 (part 3)
Types of Explosive Ordnance

ATTACHMENT 2

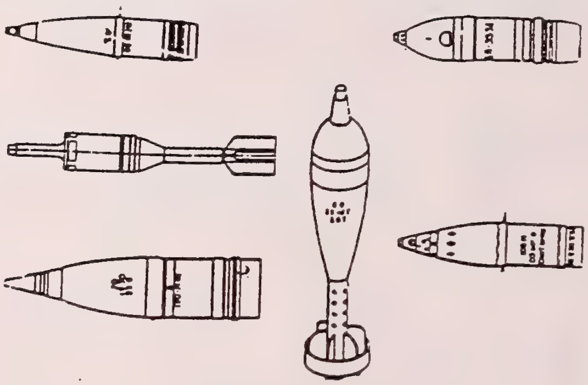
EXAMPLES OF EXPLOSIVE MUNITION CLASSIFIED BY MODE OF DELIVERY



Part 1
Examples of Explosive Munition Classified by Mode of Delivery

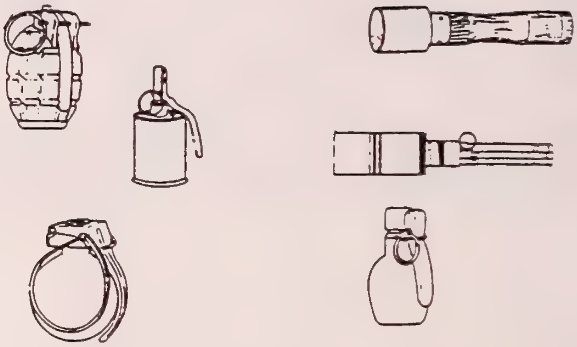
PROJECTED

PROJECTILES ARE PROJECTED THROUGH A BARREL BY A CANNISTER OR CHARGE



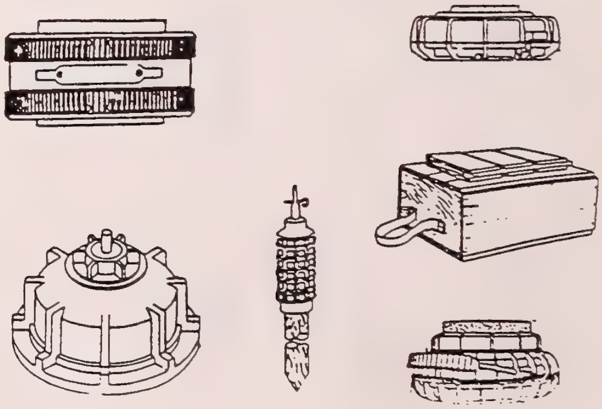
HAND GRENADES

THROWN BY HAND

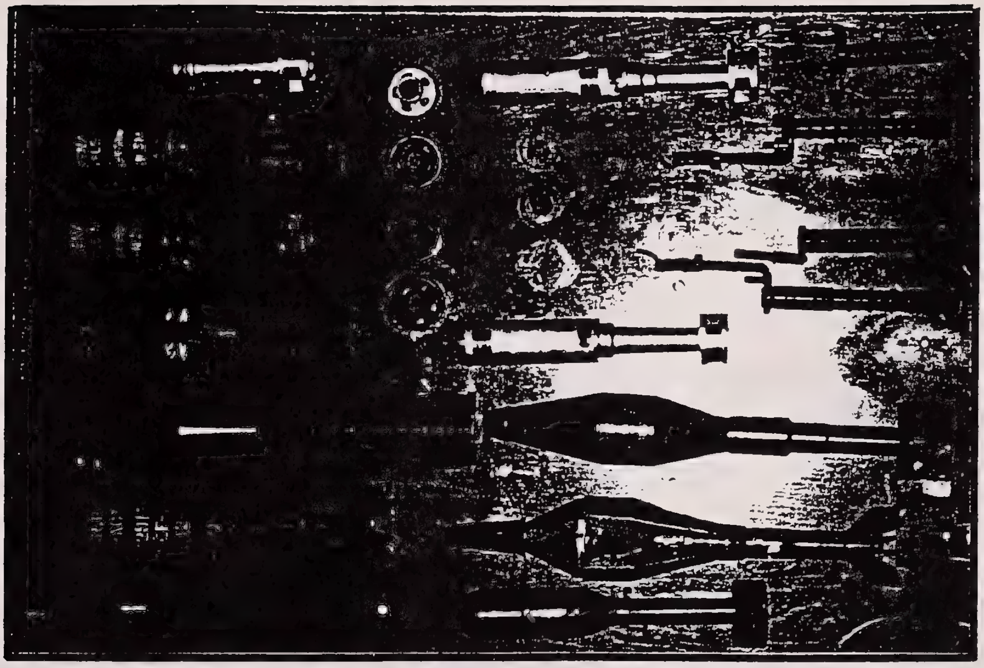


MINES

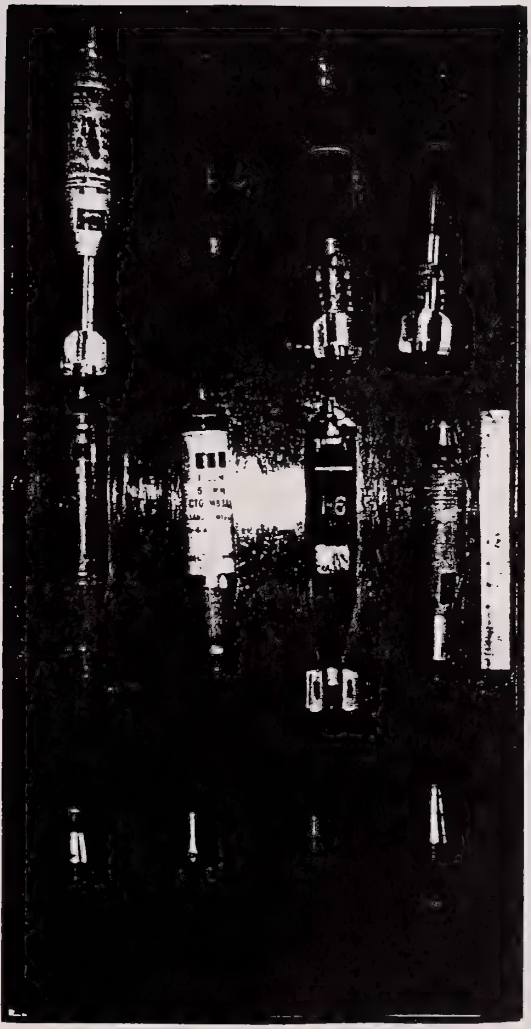
BY PLACEMENT



Part 2
Examples of Explosive Munition Classified by Mode of Delivery



RIFLE GRENADES AND GRENADE LAUNCHERS

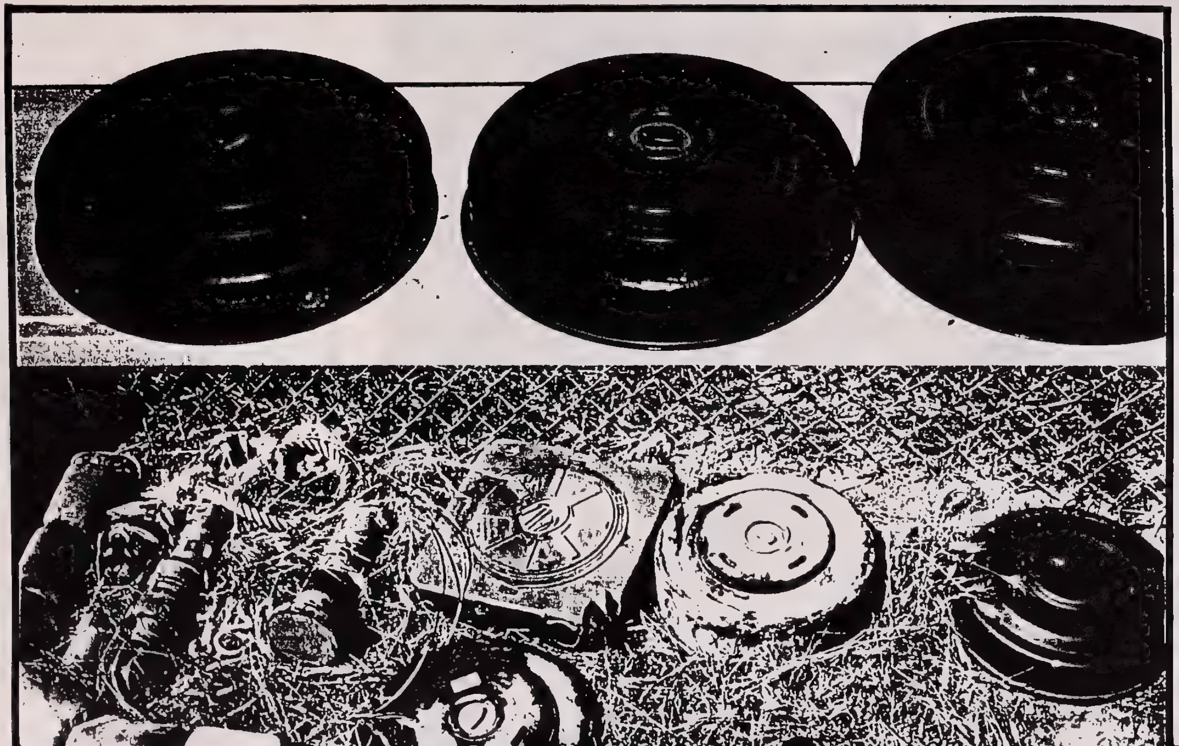


MORTAR ROUNDS

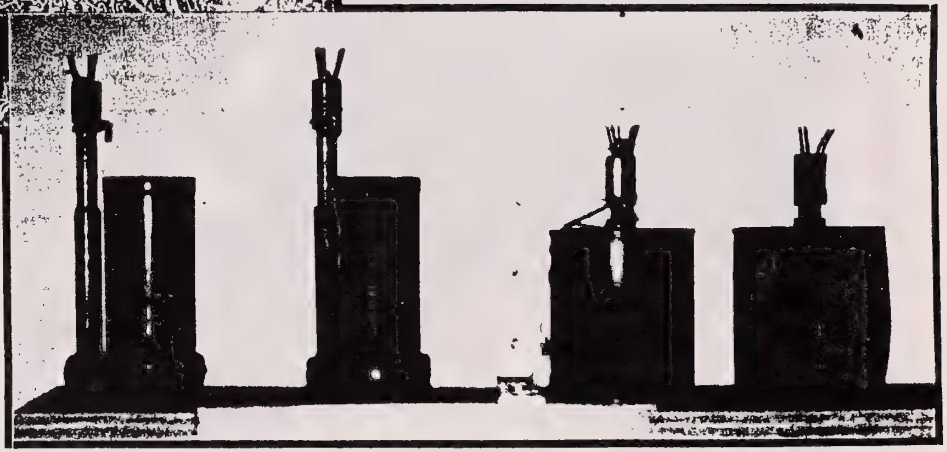
HAND GRENADES

ATTACHMENT 3

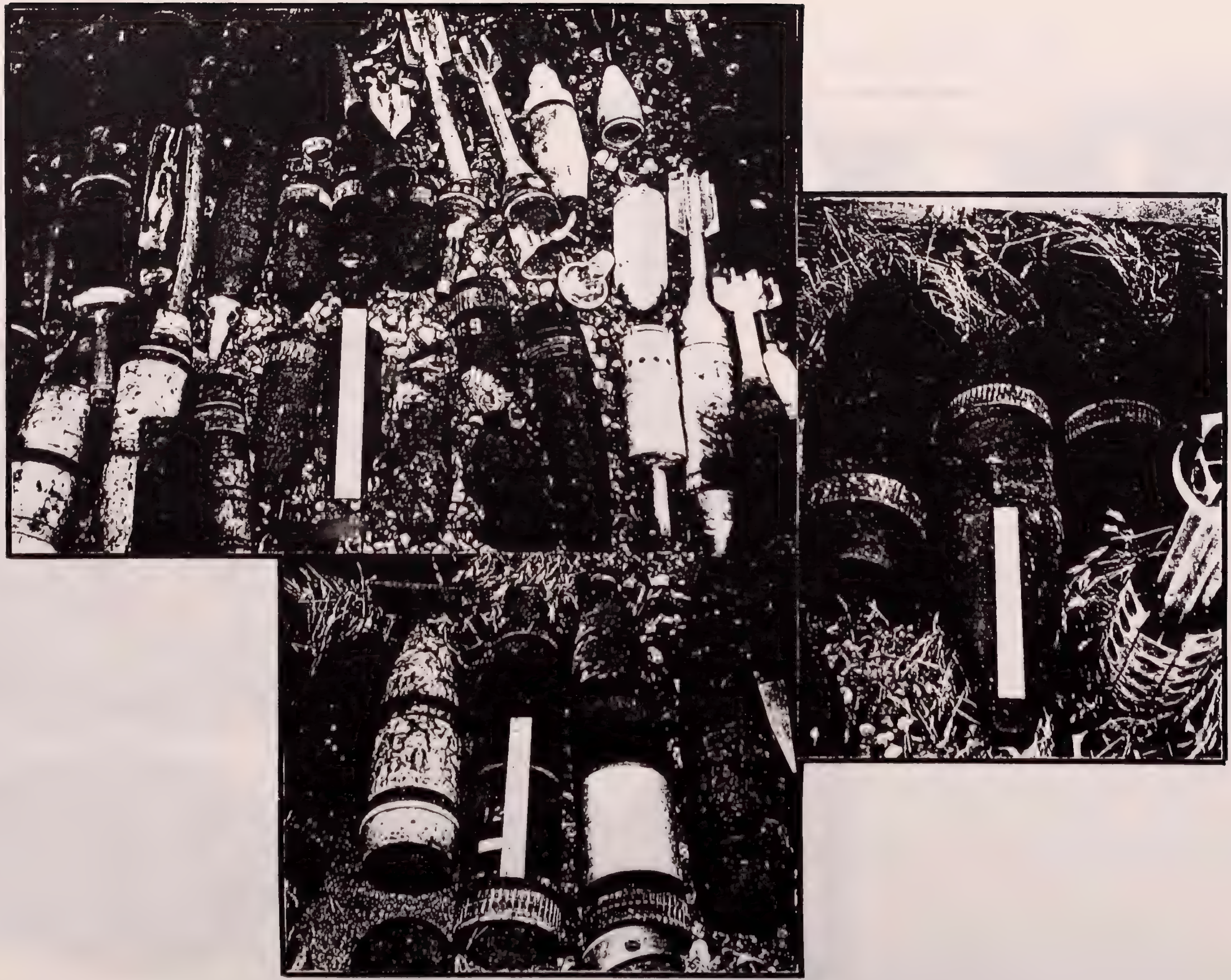
PHOTOGRAPHS OF EXPLOSIVE ORDNANCE



ANTITANK MINES

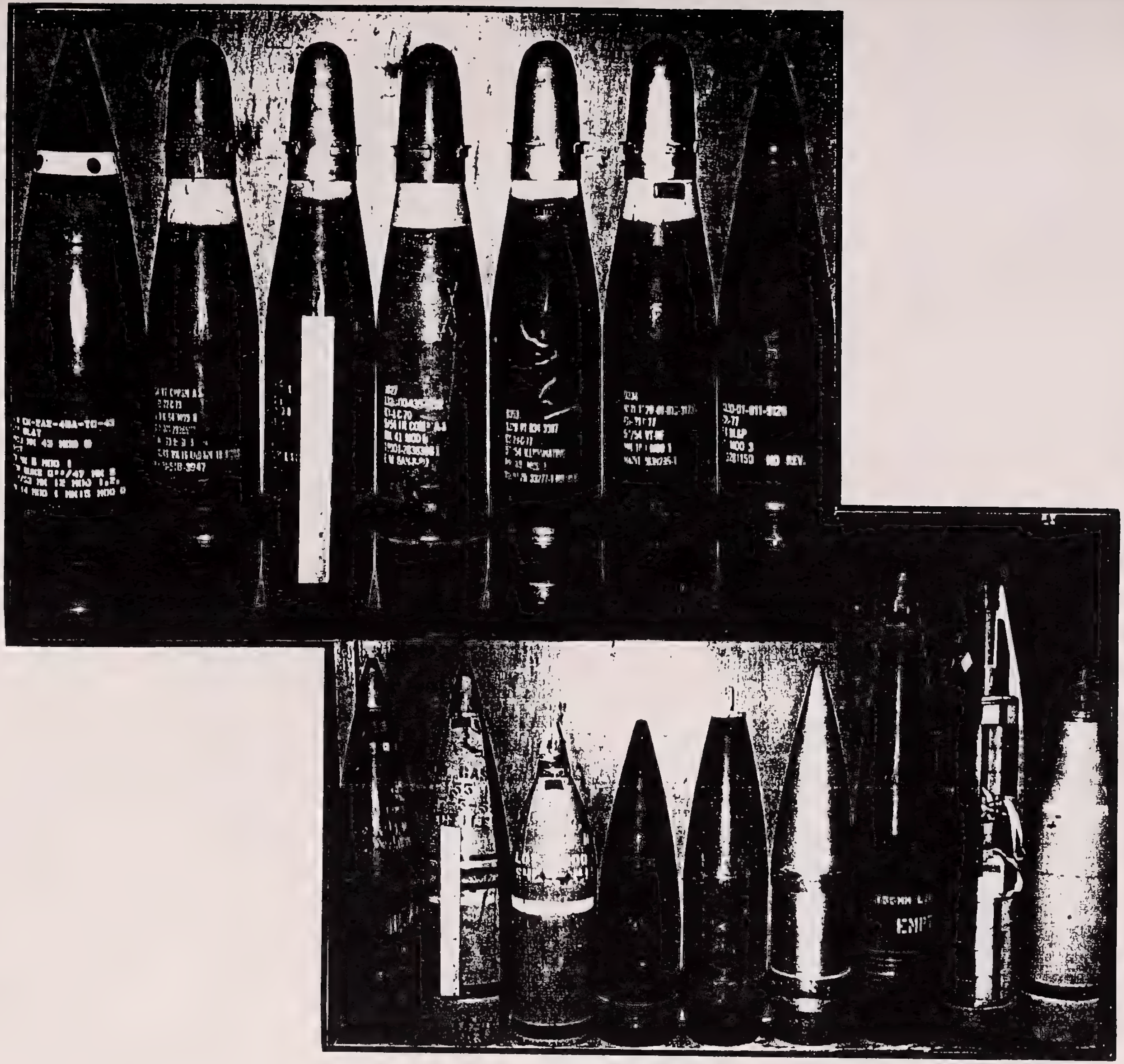


ANTIPERSONNEL MINES



UNEXPLODED MUNITIONS FOUND IN THE IMPACT AREA
(NOTE: WEATHERING)

16" in diameter
60" in height



ARTILLERY PROJECTILES

ATTACHMENT 4

POTENTIAL EXPLOSIVE ORDNANCE DISCOVERY REPORT

OGDEN

Potential Explosive Ordnance Discovery Report

Report Written by: ______________________________ Date: __________
(name, position)

Potential UXO Discovered by: ______________________________ Time: __________
(name, position)

Location of Object: ______________________________

Sketch Location:

Shape of Object (cylindrical, square, etc.): ______________________________

Size of Object (length, height, width, etc.): ______________________________

Color of Object: ______________________________

Markings (numbers, letters, etc.): ______________________________

Sketch the Object: ______________________________

Condition of item: ______________________________

Describe items used to mark the object's location: ______________________________

____

____

Has written clearance been granted to re-enter the site? ______________________________

Signature (or attach written clearance): ______________________________ Date: __________

Health & Safety/Forms/Potential Exp. Ordnance

ATTACHMENT 5

INCIDENT REPORT

INCIDENT REPORT

(Please Print Clearly)

Report Number: Report Date: Incident Date:

Project Title and Location:

Project Number:

Location of Incident:

Names of All Personnel Involved:

Describe the incident as it occurred (use additional sheets, if necessary).

Names of Witnesses	Relationship to the Incident	Where They Can Be Reached

Project Implications

What is the cost impact to the project (i.e., lost days, man-hours, equipment)?

What is the schedule impact to the project?

Does the incident impact the scope of the project in other ways? If so, how?

OGDEN

Distribution: Corporate Health and Safety Director, Health and Safety Manager or Project Health and Safety Manager, and Office HSC.

OGDEN ENVIRONMENTAL AND ENERGY SERVICES

STANDARD OPERATING PROCEDURE

S.O.P. NO. S-10
PAGE 1 OF 6
EFFECTIVE DATE 10/1/96
REVISION NO. 0
APPROVAL Denise L. Waggett, CIH

TITLE **SAFE DRIVING**

1.0 PURPOSE

The purpose of this procedure is to provide guidelines to ensure the safety of personnel while operating motor vehicles while on company business.

2.0 SCOPE

This procedure applies to all OEES employees and subcontractors who work around, operate, or are passengers in vehicles or heavy equipment while on duty.

3.0 PROCEDURES

Field work often involves transport of workers to sites by the use of vehicles. Vans or other vehicles designed to carry passengers shall be used to avoid transportation-related accidents.

3.1 GENERAL PROCEDURES

The following safe work practices will be adhered to:

- The office manager or designee is responsible for selecting an employee to serve as the vehicle maintenance coordinator. The vehicle maintenance coordinator is responsible for ensuring that all OEES vehicles for that location are regularly serviced, according to the vehicles' owner's manuals, and more frequently when necessary.

- Before operating an unfamiliar vehicle, the driver will become acquainted with the operational features of the vehicle. Some rental companies provide review cards that summarize the safety and operating controls on a vehicle. The OEES vehicle maintenance coordinator could prepare a similar card for OEES vehicles.

- Employees will immediately report any problems with vehicles they are driving or are passengers in to the vehicle maintenance coordinator.

- Drivers will carry a valid driver's license with them anytime they operate a motor vehicle.

- All employees shall use seat belts whenever on company business while driving company or personal vehicles, and will require that other persons in the vehicle will also use available seat belts. Any employee or subcontractor may be a good driver, but weather, road conditions, and other less competent drivers can affect his/her safety.

- Drivers of either company or personal vehicles, while on company business, will obey all applicable traffic rules and regulations, including posted speed limits.

- Passengers shall not stand while the vehicle is in motion.

- Horseplay in and around vehicles, especially heavy equipment, is prohibited anytime workers are on duty.

- Check vehicles once a week for the condition of brakes, accelerator, belts, radiator, oil, battery, tires, headlamps, and brake lights.

- Watch other vehicles and stay clear of vehicles that swerve in and out of traffic, brake inconsistently, fail to signal, or drive erratically.

- Respond to special conditions like rain, ice, or poor surfaces. Reduce vehicle speed and proceed cautiously.

- Stay alert whenever driving. Alcohol, drugs, medication, lack of sleep, anger, and fatigue can all be lethal when driving.

- Drivers will never attempt to move a vehicle while someone is between it and another vehicle, a wall, or anything else that is reasonably solid and immovable.

- Hazardous materials must be appropriately stored during transport to minimize the release of flammable or toxic vapors. Comply with all applicable federal, state, and local regulations regarding the transport of hazardous materials.

- To protect passengers, vehicles loaded with equipment shall have restraints (straps, cords, or cage partition) installed to prevent shifting of the equipment during transport.

- Containers of fuel are prohibited in vehicles that are in operation. Fuel tanks of generators and compressors must be empty before transport in vehicles.

3.2 WEATHER-RELATED CONDITIONS AND DRIVING

Heavy rainfall, winter snow, and ice pose special problems for even the most experienced driver. The basic rules of inclement weather driving are as follows:

- Check the vehicle frequently. Test brakes, battery, exhaust system, wipers, and defrosters (front and rear). Add anti-freeze and winter-weight oil.

- Install snow tires on drive wheels.

- Carry sand, salt, shovel, chains, snow scraper, blanket, booster cables, and a flashlight.

- Whenever driving conditions are less than ideal, be cautious. Drive slowly, test the brakes frequently, and never tailgate.

- If the vehicle skids, do not brake. The driver should take his/her foot off the accelerator and turn the car in the direction that you want the front wheels to go. Use gentle, steady motions when turning the steering wheel. Turning too much or too fast can worsen the situation. If for any reason you are unable to gain control of the car, try steering into a snowbank.

- If the vehicle gets stuck, do not continue to spin the wheels; it will only wind up in a deeper rut. Pour sand, salt, or gravel around the drive wheels to give them traction. You can also shovel snow away from the wheels and out from under the car to clear a pathway.

- Use low gears when traveling on slick surfaces (especially hills) to give added traction.

- Listen to weather forecasts. If weather and visibility are truly hazardous, postpone driving until conditions improve.

3.3 GETTING ON AND OFF

- When getting on, workers shall look before and where they step. Use handholds when available. Step squarely - avoid stepping at an angle. Never attempt to board a moving vehicle, no matter how slow it may be moving.

- When getting off the vehicle, workers shall look before and where they step, and then get off slowly and carefully, using handholds when possible. Never attempt to jump off a moving vehicle.

- Parked vehicles must be secured against movements by having the emergency brakes set, the wheels blocked, or both. This procedure applies to both automatic and manual transmission vehicles, regardless of whether they are located onsite or offsite.

3.4 JUMP-STARTING A DEAD BATTERY

To jump-start a dead battery, perform the following steps in sequence:

1. On the car with the live battery, clamp the positive (red) and negative (black) clips of the jumper cable to the positive and negative connectors of the battery, respectively.

2. On the car with the dead battery, clamp the positive (red) clip of the jumper cable to the positive connector of the battery and the negative (black) clip of the jumper cable to the engine block or frame.

3. Start the engine on the car with the live battery, and then try to start the ignition on the car with the dead battery.

4. Once the car with the dead battery starts, the jumper cables can be disconnected. Do not turn the engine off on the car with the revived battery! Disconnect the cables, negative first, then positive, from the revived car battery.

5. Disconnect the cables from the car with the live battery.

4.0 SAFE DRIVING OFF THE JOB

OEES encourages its employees to practice safe driving techniques at all times – whether on the job or off. The best defense you have against potential auto accidents is your own ability to remain alert and aware while driving. Alcohol, drugs, or medications can be lethal when you drive. They affect your ability to concentrate and severely impair your reaction time which can lead to injury, disability, or death – not only of the driver, but of passengers as well. This could be friends or family members. Be alert, be aware, and be safe.

5.0 REFERENCES

National Safety Council. 1992. *Accident Prevention Manual for Business and Industry: Engineering and Technology*. 10th ed.

Parlay International. 1991. *Office Safety, Reproducible Resources, Kopy Kit.*

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OGDEN ENVIRONMENTAL AND ENERGY SERVICES

STANDARD OPERATING PROCEDURE

S.O.P. NO. S-11

PAGE 1 OF 12

EFFECTIVE DATE 10/1/96

REVISION NO. 0

APPROVAL Daniel L. Daggett, CIH

TITLE

SIGNS, SIGNALS AND BARRICADES

1.0 PERFORMANCE OBJECTIVE

The objective of this procedure is to establish the safety requirements for the design, application, and use of signs, tags, flagging, barricades, and barriers.

2.0 SCOPE

This procedure applies to all OEES employees and subcontractors who design, procure, apply, or use signs, tags, flagging, barricades, or barrier devices on (a) construction areas, and (b) sidewalks, pathways, streets, and roadways through and adjacent to project areas managed by OEES.

This procedure also applies to all OEES personnel, personnel subcontracted to OEES, and visitors (including clients) of OEES who may work on or visit OEES jobsites.

3.0 DEFINITIONS

Barricades - Fixed or portable devices, having one to three diagonally marked horizontal rails supported by a stable base, used to control vehicular and pedestrian traffic by closing, restricting, or delineating all or a portion of an established travel route.

Barriers - Fixed or portable devices (e.g., traffic cones) designed to prevent vehicles from physically entering an area.

Flagging - High visibility tape, chain, rope, and/or bunting used to warn personnel of a hazardous location or operation.

Guardrails - Protective structure, having top and intermediate rails, and support posts, used to prevent pedestrians from physically entering an area.

Signals - Moving signs, provided by workers, such as flagmen, or by devices, such as flashing lights, to warn of possible existing hazards.

Signs - A piece of metal, plastic, wood, or paper marked with words and/or symbols and/or color-coded and located to convey a message to personnel observing the sign.

Tags - A strong strip of paper, plastic, fabric, metal or leather designed for attachment to an object and marked as a visual warning of an existing or immediate hazardous condition or operation.

4.0 RESPONSIBILITIES

4.1 FIELD MANAGER (FM)/CONSTRUCTION SUPERVISOR (CS)

The OEES FM/CS, or subcontractor supervisor is responsible for:

- Implementing the requirements of this procedure
- Ensuring that each employee under his/her supervision understands his/her responsibilities and complies with the requirements of this procedure
- Ensuring that hazards and hazardous operations which cannot be eliminated from the work place are identified, marked, and guarded by an appropriate barrier, barricade, flagging, guardrails, signs, and/or tags
- Ensuring that barriers, barricades, flagging, guardrails, signs, and tags conform to the requirements of this procedure

4.2 SITE HEALTH AND SAFETY COORDINATOR (SHSC)

The SHSC, or designee is responsible for conducting periodic surveillance to ensure compliance with all requirements of this procedure.

4.3 HEALTH AND SAFETY MANAGER (HSM)

The HSM can audit regarding the content of this SOP to ensure compliance at a field site. The HSM authorizes any deviation or modification of this SOP during field operations.

4.4 EMPLOYEES

Each OEES and subcontractor employee is responsible for:

- Complying with this procedure
- Informing supervisors of all hazards and hazardous operations which cannot be eliminated from the workplace
- Ensuring that personnel in the work place observe the instructions, directions, and intent of the barriers, barricades, flagging, guardrails, signs, and tags

5.0 PROCEDURES

5.1 ADMINISTRATIVE CONTROLS

The SHSC shall evaluate the scope of work to identify, insofar as possible, any safety sign and barricade concerns which may be involved in the work to be performed. The SHSC shall also review the site-specific Health and Safety Plan (HSP) as it pertains to signs, signals, and barricades requirements.

Upon evaluation of the work to be performed, the SHSC will identify the necessary means to minimize danger to employees.

All required safety signs and barricades shall be erected prior to the initiation of project activities or as necessitated as the work progresses.

The SHSC and site staff will inspect the work areas to determine the effectiveness of the barricades, barriers and signages. Any deficiencies will be addressed with prompt corrective action. Follow-up surveys shall be conducted by the FM/CS to evaluate job safety and the effectiveness of the safety sign or barricade. Any deficiencies and corrective actions will be addressed in the daily tailgate safety meeting.

The SHSC and/or FM/CS shall perform periodic surveillance of the jobs to ensure compliance with set forth requirements of this procedure and the HSP.

5.2 BARRICADES

Barricades shall be constructed by a person knowledgeable in the requirements of barricades and capable of constructing barricades to standard specifications.

Barricades shall be used on or around work areas when it is necessary to prevent the inadvertent intrusion of vehicular and/or pedestrian traffic. Spills and other emergency situations may necessitate the use of barricades.

Barricades shall be placed at least two feet away from the edge of a spill or other emergency situation. Guardrail systems, fences, or barricades shall be placed at least two feet from excavations that are 6 feet or more in depth when the excavation cannot readily be seen because of plant growth or other visual barriers.

Barricade rails shall be

- constructed of either 8-, 10-, or 12-inch (nominal) lumber, plastic, or metal
- at least 24 inches long
- mounted horizontally at least 36 inches above the ground
- marked with alternate orange and white 45-degree diagonal stripes

Barricade rails shall be supported by a stable base which will resist a 16-pound lateral force applied to the support 30 inches above the floor, platform, runway, ramp, or ground.

5.3 BARRIERS

Barriers shall be constructed by a person knowledgeable in the requirements of barriers and capable of constructing barriers to standard specifications.

Barriers shall be used to guard excavations across or adjacent to streets or roadways.

Barriers shall be placed at least two feet away from the edge of excavations adjacent to roadways, as applicable.

Barriers shall be

- constructed of solid material such as concrete highway bumpers, so as to protect personnel from the inadvertent intrusion of vehicular traffic
- a minimum of 36 inches in height
- painted, marked, and/or illuminated to enhance their visibility

Barriers shall be used on or around work areas when it is necessary to protect personnel from the inadvertent intrusion of vehicular traffic.

5.4 FLAGGING

Flagging shall be designed by a person knowledgeable in the requirements of flagging and capable of designing flagging to meet standard specifications.

Flagging shall not be used as a substitute for barricades or barriers. However, when there is no imminent danger to personnel, the short-term (less than 24 hours) use of flagging to identify new, unplanned hazards is permissible while appropriate barricades or barriers are being created. In some instances, flagging is suitable for excavations, providing the excavation is in a limited access area and the excavation is clearly visible.

The flagging shall be positioned such that its lowest point (including sag) is no less than 34 inches and its highest point is no more than 39 inches as measured from the ground.

Tape and chain used as flagging shall have a minimum width of 3/4-inch; rope and bunting used as flagging shall have a minimum rope diameter of 1/4-inch. Additional signs may be attached to the flagging when appropriate.

Flagging shall be placed at least six feet laterally away from the hazard being identified.

5.5 GUARDRAILS

Guardrails shall be used at every open-sided floor or platform six feet or more above adjacent floor or ground level.

Guardrails shall be constructed:

- of wood, tubular pipe, or other solid material which is suitable for use as a guardrail
- with a 2-inch by 4-inch wood or 1-1/2-inch diameter pipe top rail located approximately 42 inches (+/- 3 inches) above the floor, platform, runway, ramp, or ground
- with a 1-inch by 6-inch wood or 1-1/2-inch diameter pipe intermediate rail located approximately halfway between the top rail and the floor, platform, runway, ramp, or ground
- a 1-inch by 4-inch toeboard located not more than 1/4-inch above the floor, platform, runway, ramp, or ground when required

Guardrails shall be supported by 2-inch by 4-inch wood or 1-1/2-inch diameter pipe posts, or other solid material, spaced not to exceed 8 feet. The anchoring of posts and framing of members for railings of all types shall be of such construction that the completed structure is capable of withstanding a 200-pound force applied in a lateral or downward direction within 2 inches of the top edge. When applied in a downward direction, the top edge shall not deflect to a height less than 39 inches.

The ends of the rails shall not overhang the terminal posts except where such overhang does not constitute a projection hazard.

5.6 SAFETY SIGNS

5.6.1 General

Safety signs will be posted onsite to alert site personnel, visitors, or pass-through traffic (vehicular or pedestrian) of hazards. Examples of safety signs and color coding specifications are provided in Attachment 1. All signs shall be furnished with rounded or blunt corners and shall be free from sharp edges, burrs, splinters, or other sharp projections. The ends or heads of bolts or other fastening devices shall be located in such a way that they do not constitute a hazard. Nylon cable ties (Zip-ties) are an appropriate fastener. All signs shall be conspicuously posted in a location readily visible to personnel preparing to enter an area requiring the sign.

5.6.2 Danger Signs

Danger signs shall be used where an immediate hazard exists. There shall be no variation in the design of danger signs. Danger signs shall be designed as follows:

- Danger signs shall have red as the predominating color: red upper panel, black outline letters and borders, and a white lower panel for additional black-letter wording.

NOTE: Employees shall be instructed that danger signs indicate immediate danger and that special precautions are necessary.

EXAMPLES: **DANGER - Asbestos Regulated Area**
DANGER - High Voltage
DANGER - Do Not Operate

5.6.3 Caution Signs

Caution signs shall be used to warn against potential hazards or to caution against unsafe operations. Caution signs shall be designed as follows:

- Caution signs shall have yellow as the predominating color: black upper panel and borders, yellow-letter "CAUTION" (on the black panel), and a yellow lower panel for additional black-letter wording.

NOTE: Employees shall be instructed that caution signs indicate a possible hazard against which proper precautions should be taken.

EXAMPLES: **CAUTION - Hard Hat Area**
CAUTION - Slippery When Wet
CAUTION - Men Working Overhead

5.6.4 Instructional (or Notice) Signs

Instructional (or Notice) signs shall be used to convey general instructions and suggestions. Instructional (Notice) signs shall be designed as follows:

- Instruction signs shall have green or blue as the predominating color: green or blue upper panel, white letters, and a white lower panel for additional black-letter wording.

5.6.5 Traffic Signs (Vehicular and/or Pedestrian)

Directional signs shall be used to convey directional information. Directional signs shall be designed as follows:

- Directional signs shall have white as the predominating color: black upper panel, white directional symbol, and a white lower panel for additional black-letter wording.

Exit signs shall be used to identify emergency fire exits. Exit signs shall be designed as follows:

- Exit signs shall be lettered in legible red letters, not less than six inches high, on a white field and the principal stroke of the letters shall be at least 3/4 inch in width.

5.6.6 Biological Hazard Signs

Biological hazard signs shall be used to identify the actual or potential presence of a biohazard and/or identify equipment, containers, rooms, materials, and/or experimental animals which contain or are contaminated with a viable hazardous agent. Biological hazard signs shall be designed as follows:

- Biological hazard signs shall have fluorescent orange or orange/red as the predominating color, with a contrasting color or black letters and/or symbols.

NOTE: The term "biological hazard" and "biohazard" shall include only those infectious agents presenting an actual or potential risk to human well-being.

5.6.7 Radiation Hazard Signs

Radiation hazard signs shall be used to identify radiation hazards. There shall be no variation in the design of safety signs posted to warn of radiation hazards. Radiation hazard signs shall be designed as follows:

- Radiation hazard signs shall have magenta or purple on yellow background.

5.6.8 Street Signs

Street signs shall be posted to advise motorists of construction activity and/or hazards on or adjacent to the roadway. The design of street signs shall conform to the requirements of ANSI D6.1 - (latest revision), "Manual on Uniform Traffic Control Devices for Streets and Highways." Street signs shall be the standard diamond shape, shall have a black message and border, and shall have an orange background. The message on street signs shall have a minimum letter size of five inches. Street signs shall be supported by a stable base not easily blown over by the wind or traffic.

Additional requirements for traffic control/street signs are as follows:

- Construction area and construction area ahead signs shall be used to advise vehicle operators of construction activities adjacent to the roadway.

- Road work and road work ahead signs shall be used to advise vehicle operators of construction activities on the roadway.

- Detour and detour ahead signs shall be used to advise vehicle operators of a road detour.

- Road closed and road closed ahead signs shall be used to advise vehicle operators of a road closure.

- Flagman and flagman ahead signs shall be used to advise vehicle operators when a flagman is used to control/direct traffic through a construction area on or adjacent to the roadway. Flagman shall wear a red or orange warning vest. Vests worn at night shall be of a reflectorized material.

5.7 SAFETY TAGS

5.7.1 General Guidelines

Safety tags shall be used as a temporary means of warning employees of an existing hazard, such as defective tools, equipment, etc. Safety tags shall not be used in place of or as a substitute for safety signs. Safety tags shall contain a signal word and a major message. The signal word shall be either "Danger," "Caution," "Biological Hazard," "BIOHAZARD," or the biological hazard symbol. The major message shall indicate the specific hazardous condition or the instruction to be communicated to the employee. The signal word shall be readable at a minimum distance of five feet (1.52 m) or greater as warranted by the hazard. The tag's major message shall be presented in either pictographs, written text, or both. The signal word and the major message shall be understandable to all employees who may be exposed to the identified hazard. Tags shall be affixed as close as safely possible to their respective hazards by a positive means such as string, wire, or adhesive that prevents their loss or unintentional removal.

5.7.2 Specific Guidelines

Danger tags shall be used in major hazard situations where an immediate hazard presents a threat of death or serious injury to employees.

Warning tags may be used to represent a hazard level between "Caution" and "Danger."

Caution tags shall be used in minor hazard situations where a non-immediate or potential hazard or unsafe practice presents a lesser threat of employee injury.

Biological hazard tags shall be used to identify the actual or potential presence of a biological hazard and to identify equipment, containers, rooms, experimental animals, or combinations thereof, that contain or are contaminated with hazardous biological agents.

Other tags may be used in addition to those required by this procedure or in other situations where this procedure does not require tags, provided that they do not detract from the impact or visibility of the major message on any required tag.

6.0 TRAINING

All employees shall be informed as to the meaning of the various tags used throughout the workplace and what special precautions are necessary. Additional training information is provided in Volume IV, Training Program, of this manual.

7.0 REFERENCES

Fed-OSHA. 1995. 29 CFR 1910.23, *Guarding Floor and Wall Openings and Holes.*

Fed-OSHA. 1995. 29 CFR 1910.144, *Safety Color Code for Marking Physical Hazards.*

Fed-OSHA. 1995. 29 CFR 1910.145, *Specifications for Accident Prevention Signs and Tags.*

Fed-OSHA. 1995. 29 CFR 1926.200, *Accident Prevention Signs and Tags.*

Fed-OSHA. 1995. 29 CFR 1926.202, *Barricades.*

Fed-OSHA. 1995. 29 CFR 1926.500, *Guardrails, Handrails, and Covers.*

Fed-OSHA. 1995. 29 CFR 1926.501, *Duty to Have Fall Protection.*

Fed-OSHA. 1995. 29 CFR 1926.502, *Fall Protection System Criteria and Practices.*

U.S. Army Corps of Engineers. 1992. *Safety and Health Requirements Manual,* EM-385-1-1. October.

8.0 ATTACHMENTS

1. Accident Prevention Signs and Color Coding

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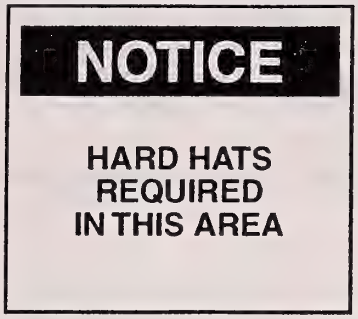
ATTACHMENT 1

ACCIDENT PREVENTION SIGNS AND COLOR CODING

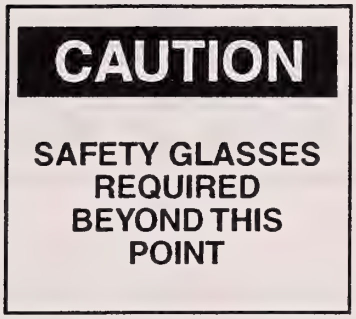
SIGNS

GENERAL INSTRUCTIONS AND
SAFETY MEASURES ARE STATED


NOTICE
HARD HATS REQUIRED IN THIS AREA

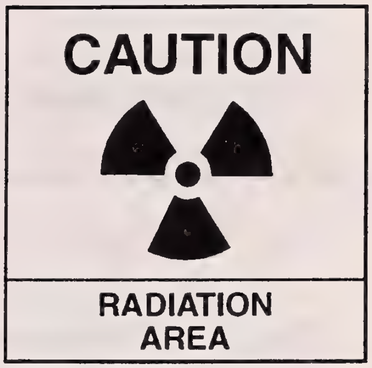
- White letters on blue or green panel
- Black letters on white background

INDICATES POSSIBLE HAZARD
TAKE PRECAUTIONS


CAUTION
SAFETY GLASSES REQUIRED BEYOND THIS POINT

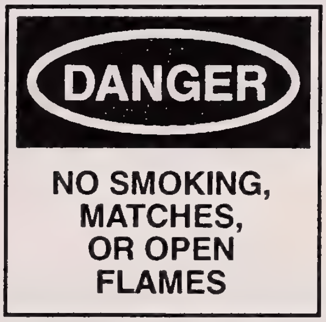
- Yellow letters on black panel
- Black letters on yellow background

INDICATES IONIZING
RADIATION HAZARD



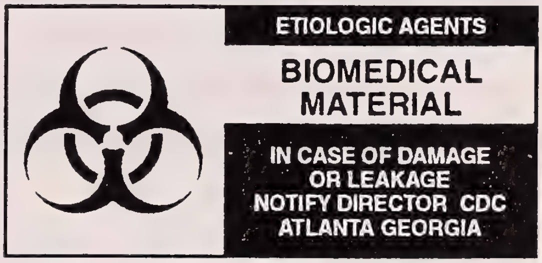
- Black logo and letters on yellow background
- Black letters on white background

INDICATES IMMEDIATE DANGER
SPECIAL PRECAUTIONS ARE NECESSARY


DANGER
NO SMOKING, MATCHES, OR OPEN FLAMES

- White letters in red oval trimmed in white on black panel
- Black letters on white background

INDICATES BIOHAZARD


ETIOLOGIC AGENTS
BIOMEDICAL MATERIAL
IN CASE OF DAMAGE OR LEAKAGE NOTIFY DIRECTOR CDC ATLANTA GEORGIA

- Logo color, in fire red on white background
- Letters in panels are white on fire red background
- Biomedical Material in fire red letters

SAFETY COLOR CODING

RED = Identifies fire protection equipment; signifies danger on portable containers (such as safety cans) and as lights on barricades and at temporary obstructions; and signifies "STOP" on emergency stops bars or switches for machinery and equipment.

YELLOW = Designates caution and marks physical hazards (such as striking against, stumbling, falling, tripping, and "caught in between"). Yellow also is the color used on flammable liquid storage cabinets, as a band on safety cans, on various materials handling equipment, and in radiation hazard areas.

BLUE OR GREEN = Designates the location of first-aid and safety equipment (not including fire protection equipment).

BLACK & WHITE = (solo, or in combination as stripes or checks) - Used for housekeeping or for traffic markings, or to provide contrast colors on other signs or objects.

ORANGE = Highlights dangerous parts of machinery or energized equipment. Also indicates "WARNING" which is a hazard between that of caution and danger.

OGDEN

Accident Prevention Signs and Color Coding

OGDEN ENVIRONMENTAL AND ENERGY SERVICES

STANDARD OPERATING PROCEDURE

S.O.P. NO. 1-4 | PAGE 1 OF 10

EFFECTIVE DATE 10/1/96 | REVISION NO. 0

APPROVAL Daniel L. Daggett, CIH

TITLE

FIELD INSTRUMENTATION: MIE INC. MINIRAM MODEL PDM 3 CALIBRATION AND OPERATION

1.0 PURPOSE

This procedure is intended to provide general operational guidelines for the MIE, Inc. MINIRAM Personal Monitor, Model PDM-3, airborne particulate monitor. This instrument utilizes scattered electromagnetic radiation in the near infrared. Radiation from a light-emitting source is scattered by airborne particles (both liquid and solid). A filter aids to screen out any light whose wavelength differs from that of the pulsed source. The MINIRAM requires no pump for its operation, and the scattering sensing parameters have been designed for preferential response to the particle size range of 0.1 to 10 micrometers (μm), which corresponds with current gravimetric methods for sampling respirable size fractions. Attachment 1 provides a diagram of the MINIRAM.

2.0 SCOPE

This document applies to all OEES personnel involved in the operation, calibration, and maintenance of the MINIRAM Personal Monitor.

3.0 DEFINITIONS

Open Sensing Chamber - Air surrounding the MINIRAM passes freely through the open aerosol sensing chamber as a result of air transport caused by convection, circulation, ventilation, and personnel movement.

Batteries - The MINIRAM is powered by a set of internal rechargeable Nickel-Cadmium (Ni-Cad) batteries which can provide continuous monitoring for more than 8.5 hours.

Liquid Crystal Display - The Liquid Crystal Display (LCD) indicates the aerosol concentration and is updated every 10 seconds. The LCD displays the reading in the units of milligrams per cubic meter (mg/m^3).

MEAS Switch - The MEAS switch activates the monitoring cycle of the MINIRAM.

Display Range - The MINIRAM normally operates in its lower display range, .00 to 9.99 mg/m^3. If a 10-second concentration exceeds 9.99 mg/m^3 the display switches to the .0 to 99.9 mg/m^3 range and remains in that range as long as the 10-second measured concentration exceeds 9.99 mg/m^3.

MEAS and TIME - This function only operates when the battery charger is plugged in and is supplying power to the instrument. When TIME is pressed and held down and MEAS is then pressed simultaneously the MINIRAM will operate as in the measurement mode and the display will read CGO for "Continuous Go." The MINIRAM will then operate for an indefinite number of 8.3-hour runs, restarting automatically after each 8.3-hour run, until the OFF key is pressed or until the batteries are exhausted. Concentration averages and timing information for the last seven 8.3-hour runs will remain in storage at any given time.

OFF Switch - When this key is pressed the MINIRAM will discontinue whatever mode is underway.

OVR Indicator - A display area in the upper right corner of the LCD. During measurement mode it indicates a detection circuit overload. When playing back stored information, it indicates the shift or run number being displayed.

TIME Switch - Prompts the LCD to display the time, in minutes, since the start of the last measurement run.

TWA Switch - The Time-Weighted Average (TWA) switch will prompt the LCD to indicate the TWA, or the average concentration in mg/m^3, up to the instant that the switch is pressed.

SA Switch - The Shift-Average (SA) switch will prompt the LCD to display the aerosol concentration, up to that moment, averaged over an 8-hour shift.

PBK Switch - When the instrument is in the OFF mode the stored information can be played back by pressing PBK for more than 1 second. First, the identification number is displayed with the ID indicator bar on. Next, the shift or run number (7 through 1, starting with the last run) is shown, with the OVR indicator bar on as identification. Then the sampling time, in minutes, for that run is shown followed by the off-time between the last and next run, in tens of minutes, and then the average in mg/m^3. This sequence is repeated seven times (one for each shift or run). An average reading of 9.99 indicates that a significant overload occurred during that run. The PBK function takes a total of 70 seconds.

ZERO Switch - The ZERO function determines the background level of reflection of the small amount of light from the infrared sensing chamber. The background level is referred to as the zero value, and is subtracted from the aerosol concentration readings during the measurement mode. The zero value will increase somewhat as the chamber inner walls and windows become contaminated with dust. Pressing ZERO during the measurement period provides momentary display of the stored zero concentration readings. To update the zero value the MINIRAM must be in its off condition and in a “clean air” environment or inside an airtight bag or the Z-bag provided by the instrument manufacturer.

ID# - Pressing ID# during a measurement period provides momentary display of the identification number stored within the MINIRAM memory.

Sunshield - The sunshield accessory serves to protect the MINIRAM sensing elements from excessive ambient light fluctuations. It should be used whenever the MINIRAM is to be operated outdoors or under fluctuating bright light. The sunshield also prevents loose clothing or other objects from touching or entering the open sensing chamber. The use of this accessory causes an insignificant alteration of the air exchange rate between the outside and inside of the sensing chamber.

Time-Weighted Average Exposure (TWA) - The TWA exposure is the actual airborne concentration averaged over a specified period of time (i.e., 8 hours or 15 minutes).

4.0 RESPONSIBILITIES

4.1 HEALTH AND SAFETY MANAGER (HSM)

The HSM is responsible for approving instrument procedures for issue.

4.2 HEALTH AND SAFETY COORDINATOR (HSC)

The HSC arranges for the training of personnel in the use of the instrument covered by this procedure.

4.3 SITE HEALTH AND SAFETY COORDINATOR (SHSC)

The SHSC is responsible for the field implementation of this procedure.

5.0 PROCEDURE

5.1 OPERATING

When using the MINIRAM for monitoring it should be positioned vertically with the display panel facing upwards by clipping the MINIRAM to the belt, shoulder strap, hard hat, or other convenient location. The sensing chamber portion should not be used as a carrying handle, particularly not while operating the MINIRAM, because this may affect the measurements. The vertical monitoring position minimizes potential particle deposition within the sensing chamber. If it is not practical to operate the MINIRAM in the vertical position, it can also be operated in the following positions:

- horizontal, resting on the belt clip
- handheld (while ensuring that hand and fingers are away from the openings of the sensing chamber)
- using a MINIRAM table stand, if available
- wall-mounted using a belt clip, or the four battery pack attachment screws on the back of the MINIRAM

5.1.1 Measurement Mode

If the MINIRAM shows a blank display, press OFF and wait until the display reads “OFF” before activating measurement mode.

When the MINIRAM reads "OFF," press MEAS to initiate the measurement cycle. The first readout displayed is "GO." This will be followed by the last concentration reading or ".00". Roughly 36 seconds after activating the measurement cycle the first new 10-second averaged concentration reading will be displayed. Readings are displayed in mg/m^3. Record readings on a Site Air Surveillance Record (Attachment 2).

The MINIRAM will run in the measurement mode for 500 minutes (8 hours and 20 minutes). Once the MEAS mode has been entered this sequence can only be interrupted by pressing OFF. Other functions can be operated during the measurement mode only for the duration of the time that the other function key is pressed, without affecting the measurement cycle.

If TIME is pressed during the measurement mode the display will show the elapsed time, in minutes, to three significant figures, from the start of the last measurement run. The MINIRAM will automatically return to concentration display after the TIME key is released.

The TWA switch, if pressed during the measurement mode, will indicate on the display the average concentration in mg/m^3 up to that instant, from the start of the last run. The value of the TWA is updated every 10 seconds. After releasing the TWA key the MINIRAM display returns to the 10-second concentration display.

The SA Switch, if pressed during the measurement mode, will provide a display of the aerosol concentration, up to that moment, averaged over an 8-hour shift period.

5.1.2 Off Mode

When the OFF switch is pressed the MINIRAM will discontinue the measurement mode. The LCD will read "OFF" for 48 hours (unless another key is pressed during that period), after which the display will be blanked. When the OFF switch is pressed during a measurement cycle the MINIRAM will store the concentration average and elapsed monitoring time up to the time of that OFF command for approximately 6 months.

5.1.2.1 Playing Back Stored Information

When the instrument is in the OFF mode the stored information can be played back by pressing PBK for more than 1 second. First, the identification number is displayed with the ID indicator bar on. Next, the shift or run number (7 through 1, starting with the last run) is shown, with the OVR indicator bar on as identification. The sampling time, in minutes, for that run is shown followed by the off-time between the last and next run, in tens of minutes, and then the average in mg/m^3. This sequence is repeated seven times (one for each shift or run number). An average reading of 9.99 indicates that a significant overload occurred during that run. The PBK function takes a total of 70 seconds.

5.2 ZEROING

To zero the MINIRAM it must be in the OFF condition. Perform the zeroing either in a clean air environment or using the Z-bag or a plastic ziploc bag.

To use the Z-bag for zeroing the MINIRAM in the field:

1. Remove the rubber bulb/filter assembly from the Z-bag. Place Z-bag on a flat surface with red flow fitting facing up. Flatten bag. Remove small plastic cap from flow fitting on bag.

2. Insert ribbed elbow connector attached to filter cartridge into red flow fitting of plastic bag until connector is flush with bottom of red flow fitting.

3. MINIRAM should be in its OFF condition. If display is blanked or if MINIRAM is in the MEAS mode, press OFF.

4. Open the Z-bag and place MINIRAM inside, approximately at its center.

5. Key ZERO through the open end of the Z-bag. Immediately zip closed the Z-bag and begin to pump the hand bulb.

6. The Z-bag should inflate as hand pumping continues, up to a height of about five inches. Continue pumping gently to maintain bag interior pressure, until the MINIRAM displays OFF again.

7. Unzip the Z-bag and remove the MINIRAM. MINIRAM is now ready for monitoring.

8. Place rubber bulb/filter assembly inside Z-bag, and plug small plastic cap into flow fitting to close it. Zip close while flattening Z-bag to store it to ensure cleanliness of the bag interior.

9. Document zeroing on the Instrument Calibration Log (Attachment 3).

To use a clean air environment or a plastic ziploc bag for zeroing the MINIRAM in the field:

1. MINIRAM should be in its OFF condition. If display is blanked or if MINIRAM is in the MEAS mode, press OFF.

2. Once the MINIRAM has been placed in the clean air environment or bag, press zero. When the display indicates "OFF" again, the MINIRAM zeroing is complete.

3. Document zeroing on Instrument Calibration Log (Attachment 3).

5.3 MAINTENANCE

A zero level reading of greater than 3 mg/m^3 indicates excessive chamber contamination. In order to clean a soiled sensing chamber remove the chamber by gently pushing it away from the display/control panel end, using both thumbs, sliding it out of its channel. Avoid touching the sensing lenses with your fingers. The two lenses can be wiped using lens tissue. The sensing chamber should be kept clean by washing with soap and water and rinsing thoroughly to remove any residues from the glass windows and interior of the chamber. Do not use solvents of any kind or rub the interior surfaces of the chamber if they have the manufactured coating. Allow the sensing chamber to dry completely and re-insert by sliding the sensor back onto the control panel.

5.4 TROUBLESHOOTING

There are two trouble bar indicators on the MINIRAM display, identified as OVR and BAT.

Indications	**Possible Causes**
OVR - detection circuit overloaded	Object inserted into sensing chamber Sudden exposure to sunlight
BAT - battery voltage insufficient	Inadequate charging time

Other problems that may arise and their solutions are as follows:

Problem	**Solution**
No response when OFF key is pressed	Recharge battery pack. If still no response, check the measure output of battery charger. The volt meter should read about 24.5 Va.c. If charger is sufficient, remove battery pack and slightly separate 2 gray connectors. Attach voltmeter + lead to red wire and - lead to black wire. Voltmeter should read about 8.5 Vd.c. while plugged into the charger. If battery pack is adequate, check the fuse on the circuit board. The fuse is located 3/8 inch behind the analog output jack and is designated F1 on the circuit board. Leaving the - lead of the voltmeter connected to the battery pack use the + lead to check voltage on both sides of fuse. Voltage should be the same as in C above. If not, fuse must be replaced by factory.
Unit constantly displays .0.3$^-$	Electronic component failure. Send unit back to MIE or rental company for repair and recalibration.

Problem	Solution
Improper display segments appear	Contaminated circuit or display board. Remove battery pack and clean affected areas with small brush. Do not use cleaning fluids or solvents on circuit boards. If brushing does not correct problem. Send unit to MIE or rental company for repair.
Pressing TWA, ID, TIME keys during MEAS mode causes unit to shut off	Keypad failure. Send to MIE or rental company for repair. Or display board contamination (see above for cleaning of board).

5.5 BATTERY CHARGING

When the battery pack for the MINIRAM is discharged it should be recharged for a minimum of 14 hours. There is no danger of overcharging if the charger is left connected for an indefinite time. The batteries should occasionally be discharged completely and then recharged.

6.0 RECORDS

6.1 PROCEDURE

A copy of each approved procedure and revision shall be retained as a permanent record in accordance with company procedures. Monitoring results shall be recorded on the Site Air Surveillance Record (Attachment 2).

6.2 CALIBRATION

Instrument Calibration Logs (Attachment 3) will be maintained in the health and safety portion of the project files and/or on a log with the instrument.

7.0 REFERENCES

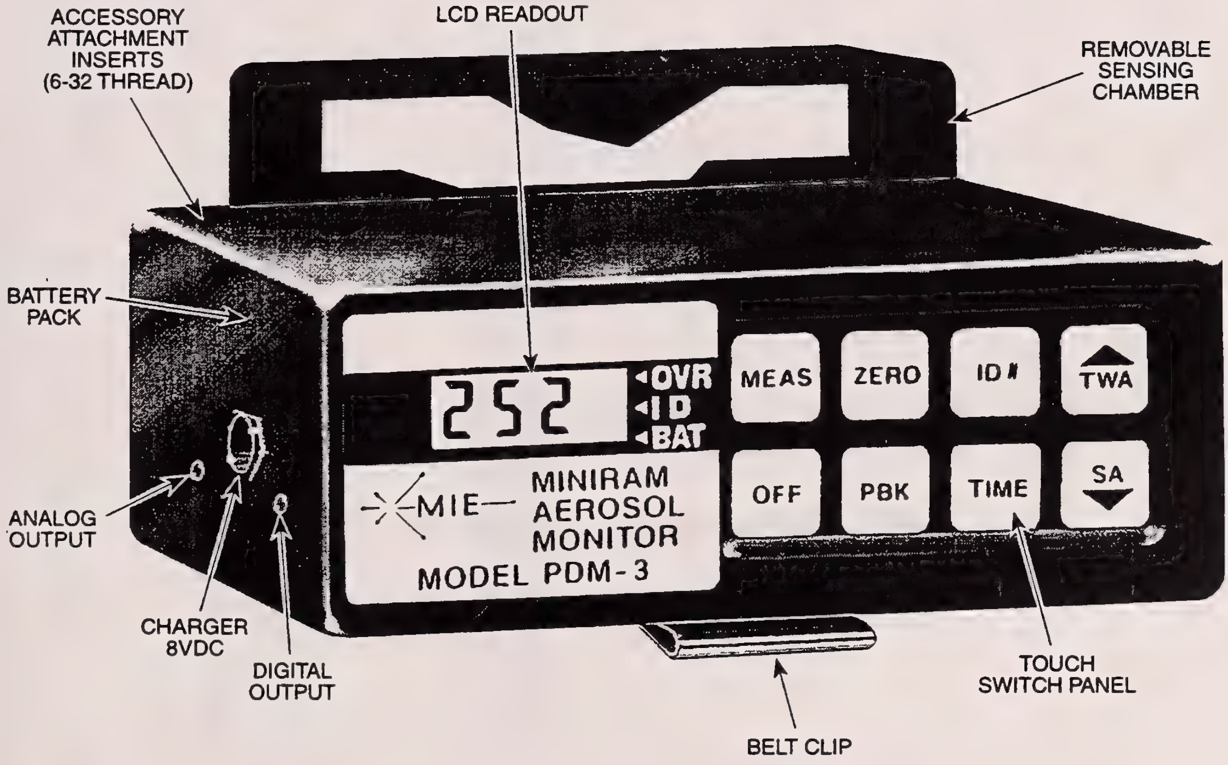
MIE, Inc. Model PDM-3 Operations Manual.

8.0 ATTACHMENTS

1. Main View of MINIRAM
2. Site Air Surveillance Record
3. Instrument Calibration Log

ATTACHMENT 1

MAIN VIEW OF MINIRAM



SOURCE: MIE, Inc., "Model PDM-3 Operations Manual"

OGDEN

Main View of MINIRAM

ATTACHMENT 2

SITE AIR SURVEILLANCE RECORD

SITE AIR SURVEILLANCE RECORD

SITE INFORMATION

JOB #:
SITE MANAGER:

DATE:
H&S COORDINATOR:

Page ______of___

SITE LOCATION:

SITE CONDITIONS

TEMPERATURE:
RELATIVE HUMIDITY:
WIND SPEED & DIRECTION:

SITE PERSONNEL:

SAMPLE NO.	TIME	SAMPLE DESCRIPTION	LOCATION	INSTRUMENT	READING	COMMENTS

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Page ______ of ______

SAMPLE No.	TIME	SAMPLE DESCRIPTION	LOCATION	INSTRUMENT	READING	COMMENTS

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ATTACHMENT 3

INSTRUMENT CALIBRATION LOG

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INSTRUMENT CALIBRATION LOG

Project: ____________________

JOB # ____________________

Location: ____________________

Date/Time	Instrument	Serial Number	Span Gas Substance	Span Conc.	Instrument Reading at Calibration	Instrument Calibration Reading Post Sampling	Comments

OGDEN ENVIRONMENTAL AND ENERGY SERVICES

STANDARD OPERATING PROCEDURE

S.O.P. NO. 1-10 | PAGE 1 OF 10

EFFECTIVE DATE 10/1/96 | REVISION NO. 0

APPROVAL Denise L. Waggett, CIH

TITLE

PERSONAL MONITORING FOR VAPORS AND GASES

1.0 PURPOSE

This procedure is intended to provide general operational guidelines for the sampling of vapors and gases. It should be noted that individual equipment or situations may require different procedures. Gases and vapors can be sampled using liquid media samplers, solid-sorbent tubes, and passive monitors.

2.0 SCOPE

This document applies to all OEES personnel involved in the general operation of personal sampling equipment for vapors and gases.

3.0 DEFINITIONS

AIHA-Accredited Laboratory - American Industrial Hygiene Association - accredited laboratory. Personal monitoring samples must be analyzed by an AIHA-accredited lab.

Breathing Zone - The breathing zone is defined by OSHA as 6–9 inches from the worker's mouth.

Calibration Device - A calibration device for determining air flow, expressed as volume per unit time. Calibration devices include bubble buret or SKC accuflow calibrator.

Ceiling - The concentration that should not be exceeded during any part of the working exposure. If instantaneous monitoring is not feasible, then the ceiling can be assessed by sampling over a 15-minute period except for those substances that may cause immediate irritation when exposures are short.

Charcoal Sampling Tube - A charcoal sampling tube is a porous charcoal collection medium encased in a glass tube designed to collect and hold organic vapors and gases for later analysis, e.g., a charcoal tube with 3–350 milligram (mg) sections of 20/40 mesh activated charcoal for methylene chloride or a charcoal tube with a 100 mg and a 50 mg backup section of 20/40 mesh activated charcoal for carbon tetrachloride. See Attachment 1(A) for a diagram of a sorbent tube.

Flow Rate - A flow rate is a volume to time relationship, reported as cubic centimeters per minute (cc/min) or liters per minute (lpm). (NOTE: Flow rate is identified in the OSHA or NIOSH sampling method specific for the analyte.) The flow rate is selected based on the desired sampling time and the collection efficiency characteristics of the collection media.

High Flow - A high flow is a flow rate from 750 to 5000 cc/min or 0.75 to 5 lpm.

High Flow Sampling Pump - A high flow sampling pump is a device that will pull a specific volume of air over a specific amount of time. High flow pumps are used for particulate sampling and gas and vapor sampling.

Impinger - An impinger is a liquid collection medium in a variety of containment configurations, designed to capture airborne contaminants. The contaminants are drawn through the liquid by a sampling pump and are captured by solvation or a chemical reaction in the liquid. Selection of the liquid depends on the nature of the contaminant and the associated NIOSH or OSHA method specific for the analyte. See Attachment 1(B) for a diagram of an impinger.

Low Flow - A low flow is a flow rate from 1 to 750 cc/min (or 1 to 750 ml/min).

Low Flow Sampling Pump - A low flow sampling pump is a device that will pull a specific volume of air over a specific amount of time, approximately 10 to 500 cc/min. Low flow pumps are used for gas and vapor sampling.

Maximum Volume - A maximum volume is the maximum recommended volume per sample, identified in the OSHA or NIOSH sampling method for the analyte in question. (NOTE: Maximum volume directly affects the flow rate.) The sample volume is based on the sensitivity of the analytical method.

Passive Monitor - Passive monitors (or badges) rely on the passive diffusion of contaminated air into a standard collection medium such as activated charcoal (used primarily for organic vapors), or the reaction of a contaminant with a chemical coating on the collection surface of the monitor (used primarily for reactive gases). See Attachment 2(A) for diagram.

Permissible Exposure Limit (PEL) - An employee exposure to any substance listed in any part of 29 CFR 1910 or 29 CFR 1926 shall not exceed the 8-hour time-weighted Average (TWA) given for that substance in any 8-hour work shift of a 40-hour work week. Where designated, ceiling values shall not be exceeded at any time.

Silica Gel Tube - A silica gel tube is a porous silica gel collection media, encased in a glass tube designed to collect and hold inorganic or electrically polar vapors and gases for later analysis. For example, a tube with a 520 mg and a 260 mg backup section of silica gel for methyl alcohol sample collection. See Attachment 1(A) for a diagram of a sorbent tube.

Threshold Limit Value - Short Term Exposure Limit (TLV-STEL) - A STEL is a 15-minute TWA exposure that should not be exceeded at any time during the workday, even if the 8-hour TWA concentration is within the TLV-TWA. Exposures to the STEL should not be longer than 15 minutes and should not be repeated more than 4 times per day with at least 60 minutes between each exposure.

TLV-STEL Sample - A TLV-STEL sample is a sample taken over a 15-minute period and the purpose is to identify areas of noncompliance or to ensure compliance with the TLV-STEL.

Threshold Limit Value - Time-Weighted Average (TLV-TWA) - The TLV-TWA is the airborne concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

4.0 RESPONSIBILITIES

4.1 Health and Safety Manager (HSM)

The HSM is responsible for approving instrument procedures for issue.

4.2 HEALTH AND SAFETY COORDINATOR (HSC)

The HSC arranges for the training of personnel in the use of the instruments covered by this procedure.

4.3 SITE HEALTH AND SAFETY COORDINATOR (SHSC)

The SHSC is responsible for general field implementation of this procedure.

5.0 PROCEDURES

Attachment 2 shows passive and active air sampling instrumentation. Attachment 3 shows the different air sampling setups that can be used for gases and vapors.

5.1 EQUIPMENT

- Air sampling pump with a flow rate ability which brackets what is required in the OSHA or NIOSH sampling method
- Sample medium, identified in OSHA or NIOSH sampling methods specific for the analyte in question
- Tygon™ tubing
- Calibration system (bubble buret or other primary calibration device)
- Appropriate device to attach the medium to the worker

5.2 SAMPLING PUMP PREPARATION

1. Charge sampling pump for 14 hours prior to use.
2. Assign the sample medium an identification number.
3. Prepare the sample medium in accordance with appropriate manufacturer, NIOSH, or OSHA methods specific to the analyte.

4. Attach the sample medium to the pump via the Tygon™ tubing and initially set the flow rate of the sampling pump to the range required by the OSHA or NIOSH sampling method specific to the analyte in question. The pump rotameter provides an approximate indication of the flow rate. (NOTE: A representative sample medium must be in line for proper flow rate and calibration adjustments.) Flow rate and expected sampling time should not exceed the maximum volume. See Attachment 4 for diagrams of sampling trains.

5. Calibrate the sampling pump and record on Instrument Calibration Log (Attachment 5) or per site requirements. Refer to SOP I-7, *Field Instrumentation: SKC Model 224-PCXR7 Calibration and Operation*, for an example of the calibration train. (NOTE: Calibration will occur before and after use. The pump, if possible, should not be turned off at any time until sampling is complete and post-calibration has been performed.)

5.3 PASSIVE MONITOR PREPARATION

1. Remove the monitor and closure cap from the package. Save the original shipping container for sending exposed monitors to the laboratory for analysis.

2. Before monitoring, record the following information:
   - monitor serial number
   - sampling date
   - employee I.D. and corresponding sample number
   - temperature and relative humidity
   - compounds to be analyzed for

3. Record the start time on the label of the monitor and assign and record a sample I.D. number to monitor.

5.4 PERSONAL SAMPLING WITH PUMP

The sampling pump setup for monitoring is shown on Attachments 3(B) and 3(C).

1. Attach the sampling pump (it should already be turned on) to the waist of the worker, being as careful as possible not to interfere with his/her work or work movements.

2. Route the Tygon™ tubing either up the chest or under the arm and up the back of the worker being sampled, so that the sampling medium at the end of the tubing is in the breathing zone (on the lapel of the worker's shirt). If needed, the tubing may be taped to the worker to minimize interference of movement.

3. Attach the sample medium holder to the shirt lapel on the worker so that it is facing downward and within the breathing zone.

4. Conduct personal sampling according to OSHA or NIOSH sampling methods specific to the analyte. Observe the sampling pump frequently to verify that the sampling pump continues to function.

5. Prepare and label sampling-medium field blanks at the same time sampling begins. These blanks should consist of unused sampling media from the same lot used for sampling. Prepare, handle, and ship the field blanks exactly as the samples, but do not draw air through them. Field blanks should account for approximately 10 percent of the samples collected.

6. At the end of the sampling period, remove the sample medium. Label the sample. (NOTE: If possible, do not turn off the sampling pump until post-calibration has been performed.)

7. Prepare control blanks. Take the control blanks straight from the package, label, and seal them. Handle and ship the control blanks exactly as the samples and field blanks. One control blank should be analyzed with each batch of samples. Record lot number in health and safety log.

8. Assure proper documentation of sampling date and times, atmospheric conditions, sample medium identifications, and pre-/post-calibration; complete the Workplace Exposure Monitoring Record (Attachment 6) and Instrument Calibration Log (Attachment 5).

9. Perform decontamination procedures on all sampling equipment according to the site-specific Health and Safety Plan (HSP) prior to removal from the work area.

10. Prepare chain-of-custody form for the AIHA-accredited lab, listing all samples, blanks, and controls.

11. Submit to lab using specified shipping procedures. Include samples, blanks, chain-of-custody form, and an analysis request, including analyte(s), flow rate(s), and sampling time(s). This form is typically provided by the laboratory.

5.5 AREA SAMPLING WITH PUMP

1. Prepare a sampling pump per Section 5.2, Sampling Pump Preparation.

2. Determine areas of concern such as downwind, exhaust air streams (6–8 feet away), and several locations within the work area to be sampled.

3. Securely attach pump(s) to a stationary object that does not impede air flow and hang the sample medium 4 to 8 feet above the ground with the sample tube facing downward.

4. Collect samples in accordance with the sampling plan.

5. Prepare and label sampling-medium blanks at about the time sampling begins. These blanks should consist of unused sampling media from the same lot used for sampling. Prepare, handle, and ship the field blanks exactly as the samples, but do not draw air through them. Field blanks should account for approximately 10 percent of the samples collected.

6. Remove the sample medium from the pump tubing. Label the sample. (NOTE: Do not turn off the sampling pump until post-calibration has been performed.)

7. Prepare control blanks. Take the control blanks straight from the package, label, and seal them. Handle and ship the control blanks exactly as the samples

and field blanks. One control blank should be analyzed with each batch of samples. Record lot number in health and safety log.

8. Assure proper documentation of sampling date and times, atmospheric conditions, sample medium identifications, and pre-/post-calibration. Complete the Workplace Exposure Monitoring Record (Attachment 6) and Instrument Calibration Log (Attachment 5).

9. Perform decontamination procedures on all sampling equipment prior to removal from the work area, according to the site-specific HSP.

10. Prepare chain-of-custody form for the AIHA-accredited lab, listing all samples, blanks, and controls.

11. Submit to lab using specified shipping procedures. Include samples, blanks, controls, chain-of-custody form, and an analysis request, including analyte(s), flow rate(s), and sampling time(s). This form is typically provided by the laboratory.

5.6 PERSONAL SAMPLING WITH PASSIVE MONITOR

The passive monitor setup is shown on Attachment 3(A).

1. Immediately attach the monitor to the employee as near the breathing zone as possible (a lapel or shirt collar is appropriate).

2. Follow the manufacturer's instructions to initiate sampling.

3. After the sampling period follow the manufacturer's instructions to cease sampling.

4. Snap any closure cap firmly onto the monitor body being careful to verify that any port plugs are firmly seated.

5. Record end time on the monitor and in your records.

6. At the monitoring site, remove another monitor from its package to use as the field blank. Handle this monitor just as it was handled in Steps 2 and 4 (above).

7. Prepare control blanks. Take the control blanks straight from the package, lable, and seal them. Handle and ship the control samples exactly as the samples and field blanks. One control sample should be analyzed with each batch of samples. Notate log number in health and safety log.

8. On the monitor, record the sample I.D.

9. Return the monitors to their original package and seal appropriately.

10. Keep monitors in an area free of organics.

11. Send the monitors to the laboratory within the required time period.

6.0 DATA EVALUATION

The analytical results are typically provided by the AIHA-accredited laboratory within 1 to 2 weeks of sample submission. Though some labs will perform calculations to determine airborne concentrations based on the sample flow rate and duration, many will not. Often times, the only results provided by the lab will be the analyte concentration in the sample solution, not the actual airborne concentration. In either case, it is important that exposure calculations be performed by OEES personnel to determine airborne concentrations expressed as a TWA.

The following computation formula shall apply to employee exposure:

$$E = (C_aT_a + C_bT_b + \ldots C_nT_n) \div 8$$

where:

E = the equivalent exposure for the working shift

C = the concentration during any period of time T where the concentration remains constant

T = the duration in hours of the exposure at the concentration C

The TWA (or value E) will then be compared to the OSHA PEL or TLV-TWA to determine compliance with regulatory and/or company requirements. Mixtures of contaminants may need to be evaluated using a different method. Contact the Corporate Health and Safety Director or an HSM for guidelines or support regarding exposure calculations.

7.0 RECORDS

7.1 CALIBRATION RECORD

Instrument Calibration Logs (Attachment 5) will be maintained in respective field health and safety records.

7.2 WORKPLACE EXPOSURE MONITORING RECORD

Workplace Exposure Monitoring Records (Attachment 6) will be maintained in respective health and safety project files and (if applicable) personnel records.

8.0 REFERENCES

Fed-OSHA. 1988. *OSHA Industrial Hygiene Technical Manual.* October.

Fed-OSHA. 1989. *Chemical Information Manual.* Fourth Printing, November.

National Safety Council. 1988. *Fundamentals of Industrial Hygiene.* Third Edition.

SKC. *1996 Comprehensive Catalog and Air Sampling Guide.*

9.0 ATTACHMENTS

1. Gas and Vapor Sampling Media for Sampling Pumps
2. Types of Air Sampling Instrumentation
3. Gas and Vapor Sampling Setups
4. Sampling Train
5. Instrument Calibration Log
6. Workplace Exposure Monitoring Record